COSTA RICA: ASSESSMENT OF THE IMPACT OF STRATEGIES TO REDUCE CHILD MORTALITY: THE EXPERIENCE OF COSTA RICA

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BACKGROUND

The population group under one year of age is vulnerable to a range of socio-economic, cultural and environmental factors, as well as disparities in access to health services. Therefore, the infant mortality rate is an indicator that reflects the living conditions of populations and the state of a nation's development.

Because of its relevance to public health, the reduction of infant mortality was incorporated into the Millennium Development Goals. To achieve this target, both globally and within a country, it is necessary to establish monitoring and evaluation mechanisms and tools that facilitate proper management, accountability and effectiveness in implementing national action plans and other interventions.

Costa Rica is a small Central American country. In 2010, it had an estimated population of 4.5 million people with an average per capita income of $7,851. This income places it within the group of medium-low income nations. To reduce income gaps and move towards greater social development, the country has been directing public investment towards social sectors since the mid-twentieth century.

The political will to invest in social sectors was cemented in the Constitution of the Republic of 1949, which prioritized state investment in education, health, housing and sanitation as a development strategy. This strategy has led to the redistribution of resources to universalize services and reduce gaps in the poorest social strata and in zones with lower social development.

As a result of this long-term strategy, in 2010, Costa Rica achieved a Human Development Index of 0.725, a literacy rate of 96 percent, 3.5 percent of the population living in extreme

poverty and a life expectancy of 79.1 years, with women's life expectancy reaching 81.8 years.

The maternal and infant population has always been a priority group within this political-strategic context. Therefore, in addition to programmes to provide universal health care and improve household living conditions, specific policies and plans have been established to protect children, including the currently in force National Strategic Plan for healthy and safe maternity and childhood for 2006–2015.

This report describes the strategies and plans Costa Rica has implemented to reduce infant mortality since the 1970s and describes the mechanisms and methodologies of analysis and monitoring that, since the end of the 1990s, have been used to evaluate the impact and adapt the interventions.

ORGANIZATION OF THE HEALTH SECTOR

Since its origins, the Costa Rican public health sector has adapted to changes in the country context.

Implemented in the late 1990s, the Health Sector Reform revamped the country's health model. The Reform emphasized the level of primary care and tasked the Costa Rican Social Security System (CCSS) with the responsibility to provide comprehensive and universal services to all people.

The CCSS has a network of establishments throughout the country, organized according to problem-solving capacity and referral systems. At the first level, the Basic Integrated Health Care Units (EBAIS) serve populations of around 4,000 inhabitants in each of the country's regions and are the reference for a network of peripheral, regional, national and specialized clinics and hospitals. By law, the whole population has access to health services provided by the CCSS and a set of insurance plans, which are financed by tripartite contributions by the employed, the employer and the state.

In the context of this reform, the Ministry of Health transferred its primary care posts and centres to the CCSS. As a result, the Ministry does not provide health services (unlike other countries). As a governing body within the executive branch, its responsibilities include guaranteeing access to quality health services and protecting the human habitat. To this end, it performs a set of functions aimed at formulating and implementing public policies and strategic plans and instituting regulatory, research and monitoring activities to promote public health. These activities are systematically monitored and evaluated to determine their compliance with goals and to analyse their impact on the health of the population.

ACTION PLAN FOR THE PREVENTION OF INFANT DEATHS

After an accelerated decrease in infant mortality beginning in the 1970s, infant mortality levels stabilized in the 1990s with mortality rates ranging between 12 and 14 per 1,000 live births. In 1998, the country formulated an action plan to resume the downward trend in infant mortality. The contexts and determinants of infant mortality were analysed and the effectiveness of interventions was reviewed. This provided the foundation to define actions to impact mortality risk factors during the first year of life.

Interventions included in the national plan to prevent infant deaths incorporated

strategies to update the immunization schedule; increase the coverage and quality of prenatal, childbirth and post-partum care, neonatal transport and the quality of preterm newborn care; enrich foods with micronutrients including folic acid to prevent neural-tube defects; monitor infant growth and development as an integrating element through prevention actions such as training of childcare workers; and detect and intervene in cases of growth and development problems.

Children throughout the country were provided with an official universal immunization schedule. The current schedule introduced new vaccines against severe infections that lead to disability and death, e.g. meningitis and pneumonia, incorporated in 1998, and beginning in 2006 vaccines against pneumococcal and pertussis (whooping cough) given to mothers and fathers in the post-partum period to protect newborn and infants.

The Ministry of National Planning and Economic Policy is responsible for elaborating and monitoring the National Development Plan, an instrument that integrates the government's strategic priorities in each of its administrations. The Ministry of Health, working with other health institutions, establishes the health targets to be met during each government cycle. As a national priority, reducing infant mortality is embodied in Costa Rica's National Development Plan.

INFANT MORTALITY ANALYSIS SYSTEM

To monitor and evaluate infant mortality interventions and detect opportunities for improvement, the action plan established a National Analysis of Infant Mortality System (SINAMI) to conduct a variety of studies.

Established in 1998 and formalized by Executive Decree 26932-S, SINAMI provides systematic monitoring and evaluation tools. It is structured through a set of interrelated activities developed at the national, regional and local levels to immediately detect and notify of any deaths of children under one-year old.

Once the notification is made to the local areas of the Health Ministry, an analysis of the care received by the deceased child is performed to determine if the death was preventable. Information sources used by the SINAMI include vital statistics, specialized registries, medical records, family interviews and various surveys that complement the analysis of determinants such as access to contraceptive service, prenatal controls and childbirth care.

The death certificate provides SINAMI with a primary source of data. The certificate details basic demographic variables, the place of death and the cause of death. The second data source is an extensive questionnaire that provides an in-depth analysis of each death. It includes variables related to the quality of health care services during pregnancy, childbirth, newborn care and growth-development of children under one-year old.

To implement SINAMI, a network was created that includes local, regional and national commissions composed of interdisciplinary teams, the CCSS and the Health Ministry. It also includes the participation of professionals from diverse disciplines such as obstetrics, paediatrics, nursing, pathology, social work and the statistical field to comprehensively investigate each infant death and identify the factors associated with preventability.

There is also a National System of Maternal Mortality Evaluation, which reviews the deaths

FIGURE 1. SINAMI: FINAL CLASSIFICATION, CRITICAL AREAS AND INTERVENTIONS

CAUSE OF DEATH	DEATH CERTIFICATE	AUTOPSY	FINAL CLASSIFICATION
BASIC			
ASSOCIATED			

CRITICAL AREAS IDENTIFIED IN THE HEALTH SYSTEM

- Family planning ☐
- Prenatal care ☐
- Reference system and transportation ☐
- Hospital services ☐
- Child care ☐

QUALITY RESPONSE OF HEALTH SERVICES
LIVING CONDITIONS OF FAMILY GROUP
CONCLUSIONS OF CASE ANALYSIS

WAS DEATH PREVENTABLE? Yes ☐ No ☐

INTERVENTIONS TO: Health system ☐ Family ☐ Other sectors ☐

of all mothers related to pregnancy, childbirth or the post-natal period to determine the quality of the health care system's response and the conditions of the family and social environment.

Based on data analysis and team discussion, a final classification is established and the preventability of each death determined. Critical points that require improvement are identified at the different levels of the health care system and interventions are directed to the family or other social area sectors (see Figure 1).

The infant mortality analysis commissions meet periodically to discuss findings and develop local, regional and national reports that are analysed by the country's health units and authorities. Based on the results of the SINAMI reports, specific programmes and projects have been developed to control risk factors in the maternal-infant population and changes effected in the organization and operation of the health services. The system also identifies areas in the recording of vital statistics, birth and death certificates that need improved quality and timeliness.

Data was originally logged in databases that were updated and analysed by each commission. In 2010, an online automated information centre was developed to track each variable. This enabled the data to be available on a server housing all of the national data.

Data collected by the infant mortality analysis commissions from 2000 to 2009 was entered and stored in a single database. Analysis of this information enabled the retrospective

evaluation of various aspects related to data quality and the completeness of each variable.

The implementation of the automated SINAMI database system led to higher quality of information, facilitating the capture of data and the monitoring of the completeness and timeliness of all variables. The database also facilitates local, regional and national teams' use and analysis of the information.

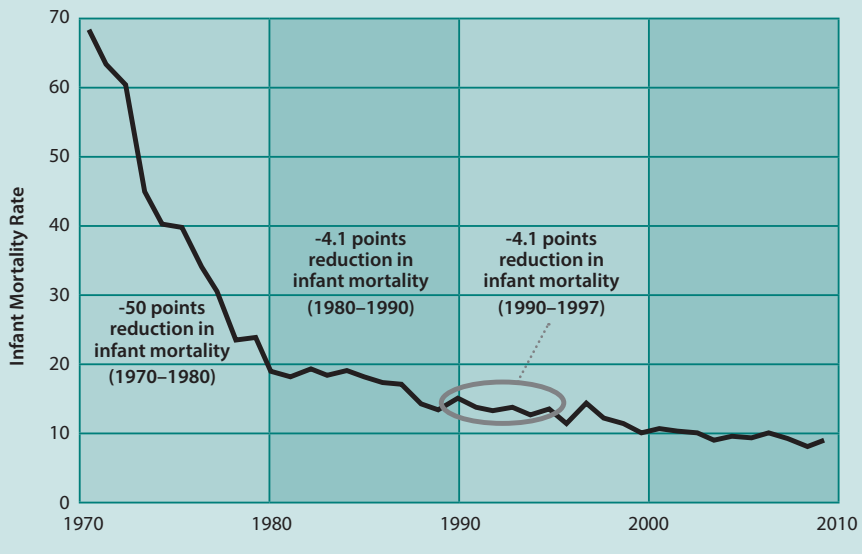
STRATEGIES AND IMPACT OF THE INFANT MORTALITY INTERVENTIONS

During the 1970s, the strategies and interventions to reduce infant mortality were oriented towards improving basic sanitation and providing a safe water supply, expanding electrification and road services, increasing the coverage of primary care programmes and universalizing social security services.

The infant mortality rate declined from 68.4 in 1970 to 19.1 per 1,000 live births in 1980 (a difference of almost 50 points). During that decade, an increase in the population's life expectancy was also achieved (which, in the case of women, represented an increase of 10 years). At the end of the 1980s, the child mortality rate fell to 15.3 per 1,000 live births, but stabilized during the 1990s (see Figure 2).

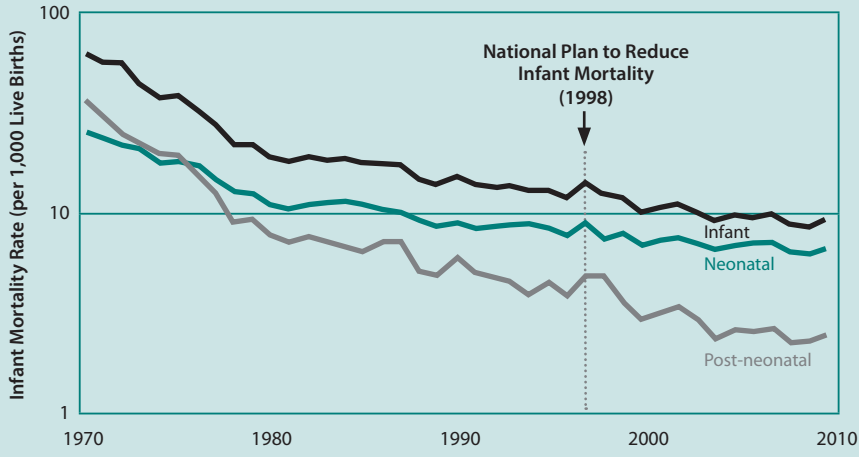
Since the implementation of the interventions outlined in the action plan at the end of the 1990s, a downward trend can be seen in both components of infant mortality (see

FIGURE 2. TRENDS IN INFANT MORTALITY RATE, COSTA RICA, 1970–2010



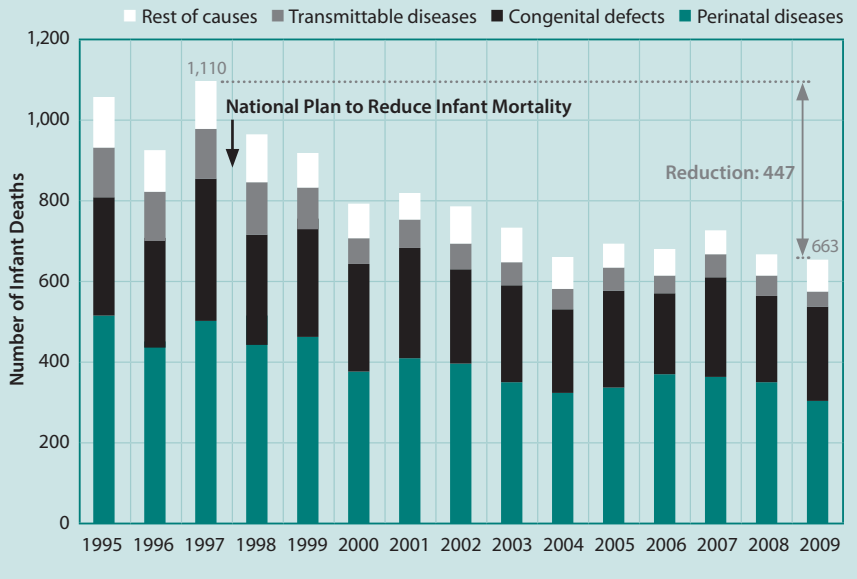
Source: National Institute of Statistics and Census, Central American Population Center

FIGURE 3. INFANT MORTALITY RATE BY AGE AT DEATH, COSTA RICA, 1970–2010



Source: National Institute of Statistics and Census, Central American Population Center

FIGURE 4. NUMBER OF INFANT DEATHS BY CATEGORY OF CAUSE, COSTA RICA, 1995–2009



ICD code categories: *Transmittable diseases:* ICD10: A00-B99, G00-G09, J00-J206, J10-J18, J20-J22; *Congenital defects:* ICD10: Q00-099; *Perinatal diseases:* ICD10: P00-96

Source: National Institute of Statistics and Census, Central American Population Center

Figure 3). During the period from 1997 to 2004, neonatal mortality decreased from 9.1 to 6.7; in 2004, the neonatal mortality rate decreased by 50 percent from 5 to 2.5.

To analyse the trends in reducing infant mortality, three categories of death were established using data from death certificates. The categories were established considering interventions that, in accordance with evidence of their effectiveness, could have prevented the deaths. Causes of death were grouped into three broad categories, according to codes from the Tenth International Classification of Diseases: perinatal diseases, congenital defects and transmissible diseases.

Between 1997 and 2009, the absolute number of infant deaths declined from 1,160 in 1997 to 663 in 2009; a decrease of 43 percent. Deaths in all three categories analysed declined during these years (see Figure 4).

If the 1995 to 1997 pre-intervention period is used as reference and compared to subsequent three-year time periods through 2009 (see Table 1), perinatal diseases show the greatest decrease (a 1.56 reduction in the mortality rate), followed by the transmissible diseases (a .89 reduction) and congenital defects (a .75 reduction).

The analysis of factors associated with the decline in infant mortality has been investigated using various methodologies. During the 1970s, studies utilized multiple regression techniques to evaluate the decline in infant mortality. The analysis indicated that economic development, reduced fertility and the extent of primary care services drove the decline.

More recently, quasi-experimental design methodologies applied to evaluate the impact of the health sector reform, using the 1985 to 2001 period as reference, indicate that the

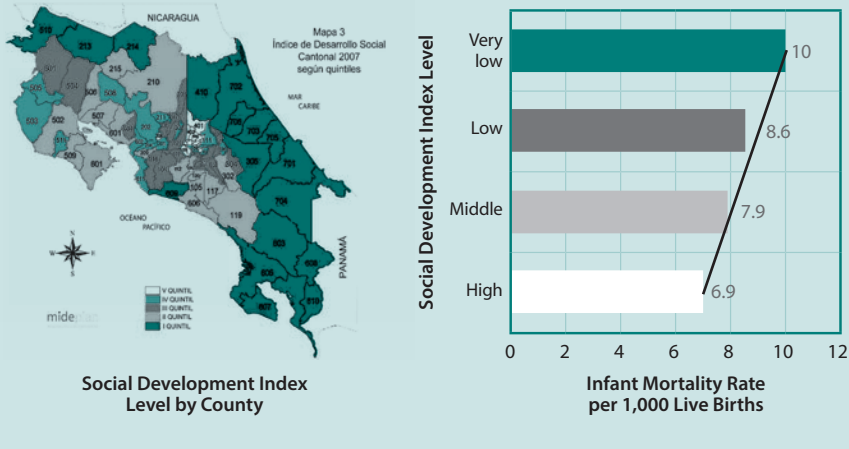
TABLE 1: INFANT MORTALITY RATES PER 1,000 LIVE BIRTHS BY CATEGORY OF CAUSES, COSTA RICA, 1995–2009

CATEGORIES OF CAUSES	INFANT MORTALITY TRIENNIAL RATES (PER 1,000 LIVE BIRTHS)					MORTALITY RATE RATIO	MORTALITY RATE DIFFERENCE
	1995-1997	1998-2000	2001-2003	2004-2006	2007-2009		
Perinatal diseases	6.22	5.63	5.29	4.84	4.67	1.3	-1.56
Congenital defects	3.81	3.35	3.40	3.05	3.06	1.2	-0.75
Transmittable diseases	1.58	1.31	0.89	0.70	0.69	2.3	-0.89
Rest of causes	1.49	1.25	1.12	1.00	0.86	1.7	-0.64

ICD code categories: *Transmittable diseases:* ICD10: A00-B99, G00-G09, J00-J206, J10-J18, J20-J22; *Congenital defects:* ICD10: Q00-099; *Perinatal diseases:* ICD10: P00-96

Source: National Institute of Statistics and Census, Central American Population Center

FIGURE 5. INFANT MORTALITY RATE STRATIFIED BY COUNTY SOCIAL DEVELOPMENT INDEX, COSTA RICA, 2009



Source: National Institute of Statistics; Census, Central American Population Center; and MIDEPLAN

adoption of sectoral reforms significantly reduced child mortality by 8 percent, which represents 120 lives saved in 2001.

The impact of fortifying foods with folic acid in order to reduce infant mortality associated with neural tube disorders was also analysed. Findings indicate that this intervention contributed to a 9 percent decline in the infant mortality rate from 1997 to 2009.

To identify differences in infant mortality within the country, all counties were stratified according to their ranking on the Social Development Index, a composite indicator developed by the Ministry of National Planning and Economic Policy that classifies the different areas of the country into four development categories: high, medium, low and very low.

Figure 5 shows the differences in infant mortality rates within these categories in 2009, where counties with high Social Development Indexes reach a rate of 7 per 1,000 live births, while the rate for counties with very low Social Development Indexes was 10 per 1,000 live births. This data indicates that there are gaps in the levels of infant mortality that depend on living conditions within communities. Lower Social Development Index levels are found in the Atlantic zone and along the country's northern border.

CHALLENGES AND OPPORTUNITIES

The challenges and the ability to maintain the downward trend of infant mortality in Costa Rica shows that despite resource constraints typical of a peripheral country, progress is possible if investments are made in the social factors that condition infant mortality. Therefore, the prevention of infant deaths must remain a priority and be considered as an essential component of public policies in the country.

Given the diversity and complexity of the conditions that determine the probability of death during the first year of life, it is necessary to have accurate and timely information to support the development of plans from an inter-sectoral perspective.

National action plans must incorporate effective mechanisms and tools for monitoring and evaluating interventions' results and impacts. The use of lessons learned about interventions' effectiveness is essential to effectively allocate resources and achieve goals.

It is necessary to ensure primary health care access and the use of measures that facilitate a comprehensive and timely response to the population needs, the appropriate risk classification, and proper case management. Therefore, national action plans must ensure access to timely and quality health services, prioritizing society's most vulnerable groups and systematically evaluating management and impacts.

The Costa Rican experience provides lessons learned not only about the implementation of action plans and strategies to reduce infant mortality and improve the health and welfare of the infant population, but also about the mechanisms used to monitor and evaluate the impact of the interventions.

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