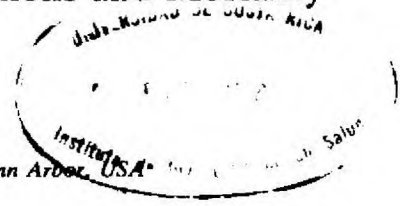


# Socioeconomic Development, Health Interventions and Mortality Decline in Costa Rica

Luis Rosero-Bixby

Department of Population Planning, University of Michigan, Ann Arbor



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Costa Rica, whose life expectancy was 74 years by 1985, has reached a health level comparable to a developed country. The health achievements of this country are product of political and socioeconomic circumstances as well as of right public health policies. Until about 1970 the features of Costa Rica mortality, although somewhat better than the Latin American average, evolved in a similar way to the rest of the region. In particular, the decades of 1940s and 1950s saw dramatic improvements in life expectancy, thanks mainly to the import of low-cost, high-effectiveness health technologies. In the 1970s, however, Costa Rica departed from a regional pattern of stagnation and managed to close the gap with developed countries in terms of mortality levels. A dramatic decline in the infant mortality rate from 60 to 19 per 1,000 took place in this decade. The main determinants of this breakthrough were health interventions, notably a primary health care program, even though favorable socioeconomic conditions and a reduced fertility also played a role. Ecological data and other evidence suggest that up to three fourths of the mortality decline was accounted for contemporary improvements in public health services, with about 40 percent attributable to primary health care interventions. Furthermore, by targeting interventions on the less privileged population, these interventions had the merit of reducing geographic and socioeconomic differentials in child mortality.

**Key words:** population dynamics, socioeconomic factors, primary health care, public health, developing countries

Costa Rica is, with Cuba, the country with the highest health status in Latin America. By the mid 1980s, life expectancy was 74 years - similar to figures in more developed countries - and the infant mortality rate was 18 per 1,000 births. This paper describes the Costa Rica success in mortality reduction, notably the breakthrough that occurred in the 1970s. Firstly, it examines the epidemiological transition in this country from a broad historic perspective. Then, the paper evaluates the relative contribution of socioeconomic conditions, in the one hand, and health in-

terventions, in the other, to the dramatic infant mortality decline in the 1970s.

## BACKGROUND

Costa Rica is a small Central American country with a population of about 3 million inhabitants. Its economy is based mainly on exporting tropical crops, predominantly coffee and bananas. Per capita income was about US\$ 1,600 in 1987, which is lower than the Latin American average (US\$ 1,800) (1). Approximately one-half of the population resides in rural areas, and a third of the labor force works in agriculture. The country is more developed socially than economically: only six percent of adults are illiterate, almost all children attend school, 70% of the population is covered by the social security system, and 87% enjoy potable water service (2).

Costa Rica racial and cultural homogeneity, political stability, and the fact that it has constitutionally renounced the right to have an army, are distinctive features of the country. In the colonial period, Costa Rica was one of the poorest and most out of the way territories of Spanish America. Towards the end of the colonial period and during the beginning of nationhood, the population constituted a relatively homogeneous society of poor peasants. The incorporation of the country into world capitalism (after the middle of the 19th century, by means of coffee exports) was more successful and achieved at a lower social cost than that of the other countries of the region. During the decade of the 1940s, important social reforms were carried out, and the old oligarchic model, inspired in the European liberalism, was replaced by a socialdemocratic, welfare-oriented system of government. Since then, the public sector has strongly favored social programs in areas such as education, labor, social security and health (3).

Health programs, in the strict sense of the term,

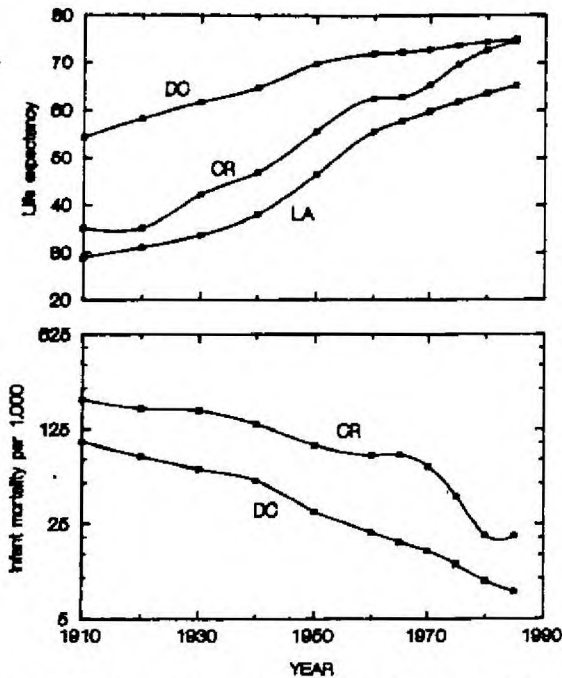


Fig. 1. Life expectancy and infant mortality rate in Costa Rica (CR), Latin America (LA) and developed countries (DC)

began in Costa Rica in the decade of the 1920s, with the creation of the Sub-Secretariat of Hygiene and Public Health in 1922, which was promoted to ministerial level in 1929 (4). In 1941 it is established the social security system, to provide medical care to workers in the formal sector and, since 1955, their families. By the end of the 1960s the health sector was organized around three basic agencies, but without much coordinations among them:

1. The Central Sanitary Office of the Ministry of Health, with limited economic resources, was in charge of preventive medicine and the implementation of such specific activities as the successful programs for control of malaria and tuberculosis;
2. The Central Assistance Office of the Ministry of Health, in charge of providing medical and hospital care (of doubtful quality) for the poor.
3. A rich social security system provided medical and hospital services (some of them highly specialized) to about 40% of the population.

This scheme was modified in the 1970s. All hospitals were transferred to the social security system. This agency expanded its coverage to 75% of the pop-

ulation. The Ministry of Health established a program of primary health care to reach the rural areas and urban slums (5).

At present, Costa Rican medicine is highly socialized. For example, only 1.2% of the hospital discharges come from the private sector. Coverage of public medical services is excellent. For example, 91% of all births occur in hospitals. The budget outlay for health in the public sector is very high. It represents seven percent of the Gross Domestic Product - similar to the also high expenditures in education.

Mortality probably started to decline in Costa Rica by the middle of the 19th century, after a cholera outbreak in 1856. Conversely, the birth rate maintained its high levels throughout the period until 1960, after having increased somewhat in the 1950s. This made for increased rates of population growth, until it reached 3.8% in 1960 - one of the highest in the world. However, after that point in time, the birth rate began a rapid decline that has, consequently, reduced the population growth.

By 1985, the population growth (2.7%) and the birth rate (31 per thousand) remain high. Conversely, Costa Rica mortality is nearly as low as that of the most advanced countries: life expectancy is close to 74 years, and the infant mortality rate is 18 per thousand. The low mortality and a peculiar intermediate age structure (highly concentrated in the ages when the risk of death is minimal) produce a crude death rate of 4 per thousand, one of the lowest in the world.

#### THE EPIDEMIOLOGICAL TRANSITION AND ITS HISTORICAL CONTEXT

Costa Rica has always exhibited a more favorable mortality situation than the Latin American average (Figure 1, which is updated from Rosero-Bixby 1985) (6). This is consistent with two historical peculiarities of Costa Rica: 1) the social homogeneity inherited from the colonial period, and 2) the economic transition toward world capitalism (by means of coffee exports) at a lower social cost than other countries of the region.

Life expectancy in Costa Rica and in Latin America as a whole was markedly lower than in more developed countries (average of Denmark, France, England and Wales, Norway, Netherlands, Sweden, and the USA) by the beginning of the century: 35 years compared with 58 years in 1920. Since then,

the gap with more developed countries has narrowed. However, whereas this progress stalled in Latin America in the 1970s, Costa Rica continued to register impressive gains (Figure 1).

The following phases characterize the epidemiologic transition in Costa Rica (6):

#### 1. The second half of the 19th century

What information is available shows that there were some improvements in life expectancy. Following the cholera epidemic of 1856, there were no more important mortality crises. The advances in these years were probably due to improvements in sanitation and the application of isolation measures to cut transmission of epidemic diseases. Besides, population's resistance to disease probably improved as a consequence of economic growth.

#### 2. The first two decades of the 20th century

During this period, life expectancy remained stable at about 35 years. Two occurrences that may have hindered any further public health progress were: 1) population settlement in malaria infected zones of the Atlantic Coast for development of banana plantations; and 2) an economic crisis during the World War I (per capita exports at 1970 prices fell down from US\$ 114 in 1913 to US\$ 64 in 1918) and the consequent deterioration in living standards.

#### 3. The 1920s and 1930s

Life expectancy during this period increased from 35 to 47 years. It was during this time that the first public health programs were initiated. Despite their initial limited coverage, these programs seem to have neutralized the adverse effects of the depression of the 1930s.

#### 4. The 1940s and 1950s

This was the time of most rapid health improvement in Costa Rica and elsewhere (Figure 1). Life expectancy rose dramatically from 46 to 63 years, which means a gain of 19 hours of life every single day in a 20-year period. This progress coincides with the advances in medical and sanitary technology that took place during or short after the World War II (antibiotics, DDT, new vaccines). It also coincides with important government initiatives, such as the creation of the Social Security system in 1941 and the reorganization of the Ministry of Health in 1950. The standard of living in Costa Rica also increased substantially during this period, and a welfare-ori-

ented government replaced the old oligarchic political system.

#### 5. The decade of the 1960s

As in the majority of Latin American countries, mortality decline slowed down. Inexpensive health programs which did not substantially alter the level of living were exhausted (7). In addition, during the first years of the decade, Costa Rica experienced a period of economic stagnation and was affected by a natural disaster: the eruptions of the Irazu Volcano in 1963-1964. As result, life expectancy increased only 3 years during the decade.

#### 6. The Decade of the 1970s

Mortality decline resumed and life expectancy rose from 65 to 73 years in the decade, bringing Costa Rica to the levels of developed countries. This decline occurred in a period of substantial rise in living standards brought about by economic growth and the redistributive policies of the government. The cumulative effects of past investments in education, communications (roads, electricity, telephones), social and health infrastructure also created optimum conditions for the implementation of a successful health policy (8). The decline observed in this decade was not as fast as that in the 1940s and 1950s, though. But it was more significant because it occurred at a mortality level at which gains are much more difficult to achieve. With the 1970s mortality decline, Costa Rica departed from the pattern of relative stagnation prevailing in Latin America. Another peculiarity of the 1970s breakthrough is that reversed the trend to widening the gap with more developed countries in the infant mortality rate (second part of Figure 1). The reduction in infant deaths had lagged behind adult mortality until that year.

### CAUSES OF DEATH

Table 1 shows the radical change in the structure of mortality by cause in Costa Rica since 1940. Of particular note is the virtual control (death rates of less than 4 per 100,000) of the mortality caused by malaria, helminthiasis, diseases preventable by immunization (mainly tetanus and measles), and respiratory tuberculosis. In 1940, these four groups accounted for 23% of all deaths, and for a crude death rate of 4.3 per thousand. The decline in diarrheal diseases has also been substantial: in 1940, they were responsible for 17% of all deaths, but by 1980, this

Table 1. Standardized death rates by cause, and their contribution to the total decline, Costa Rica 1940-1980 (6).

Cause of death group*	Rates per 100,000			% contribution	
	1940	1960	1980	1940-60	1960-80
<i>All causes</i>	1857	977	461	100	100
<i>Microorganisms</i>	1102	333	49	87	55
Diarrheal diseases	322	128	10	22	23
Influenza, pneumonia, bronchitis	233	108	26	14	16
Malaria	157	2	0	18	0
Intestinal helminthiasis	103	21	1	9	4
Preventable by vaccination**	90	35	2	6	6
Respiratory tuberculosis	77	12	3	7	2
Other infections	120	27	7	11	4
<i>Not microorganisms</i>	414	400	293	2	21
Cardiovascular	138	133	104	1	6
Neoplasms	68	94	70	-3	5
Certain chronics***	74	29	20	5	2
Certain of infancy	56	88	44	-4	8
Maternal mortality	25	8	1	2	1
Automobile accidents	1	7	17	-1	-2
Other violent	52	41	37	1	1
<i>Other and unknown</i>	341	244	119	11	24

The negative sign indicates increase mortality

\* Adapted from Preston et al, 1972.

\*\* Tetanus, measles, pertussis, diphtheria, smallpox and poliomyelitis.

\*\*\*Nephritis, cirrhosis, ulcers and diabetes.

had dropped to about two percent. Currently, Costa Rica displays a pathology similar in structure to that of the more developed countries, although the relatively young age structure ensures some differences. About half of all deaths occur in three groups of causes: cardiovascular diseases, cancer, and injuries.

As might be expected, the bulk of the decline in mortality in Costa Rica came about through the control of infectious and parasitic diseases. They accounted for almost all (87%) of the decline between 1940 and 1960, which was the era of most rapid improvement in life expectancy and of "facile" progress. In more recent years (1960-1980), the contribution of infectious diseases was reduced to 55%, indicating that factors such as access to specialized medical care have gained influence. Nonetheless, even during this latter period, the major factor for mortality decline continued to be the control of infectious diseases, particularly diarrheal diseases (23%) and acute respiratory infections (16%). These two groups of causes of death, and those preventable by vaccines did not change their contribution to the decline in mortality (42-45%) up to 1960 and thereafter. In contrast, malaria did not contribute to the

decline in mortality anymore after 1960, but it was the second most important source between 1940 and 1960. In these two decades, the death rate due to malaria dropped by 99%, and its contribution to the decline in the standardized death rate was 18%. The reduction in respiratory tuberculosis was also impressive in the earliest period (84%) and its contribution to the decline through 1960 was important (7%). The control of these two diseases can be ascribed mainly to the importation of new technologies (DDT and streptomycin) in the late 1940s. The reductions in other causes of death, such as diarrheas, acute respiratory infections, and helminthiasis, were due to a more complex set of factors.

#### THE INFANT MORTALITY BREAKTHROUGH

Before 1970, infant mortality declined less rapidly than death rates among adults, but since 1970 the reverse is true (Figure 2). The relative decline in mortality of adults was remarkable from 1940 to 1960 - the period of achievements based in imports of low-cost, high-effectiveness health technologies.



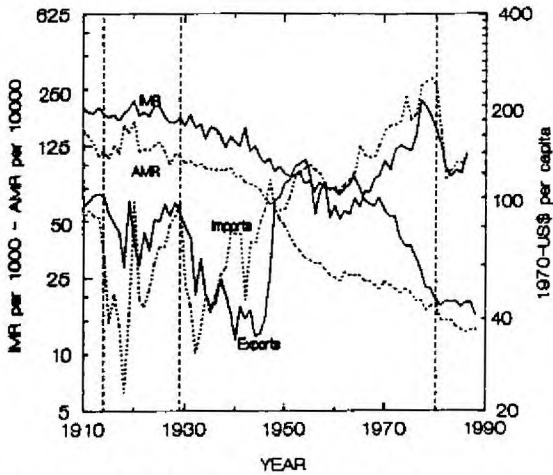


Fig. 2. Infant (IMR) and adult (AMR) mortality rate, exports and imports per capita at constant prices

Conversely, the fastest decline in the infant mortality rate took place in the 1970s. This rate dramatically fell from 60 per 1,000 in 1970 to 20 per 1,000 in 1980.

The decrease in Costa Rica infant mortality rate began to accelerate in 1972 (Figure 2), following the drawing up of the first national health plan and the institution of universal social security. All public hospitals were transferred to the social security system between 1973 and 1976, and rural and urban primary health care programs were started in 1972 and 1976, respectively. For 17 years prior to 1972 the reduction averaged 2% per year; between 1972 and 1980 the average annual decrease was 13 per cent (9).

An analysis of the cause specific decline in infant deaths has shown that the control of infection

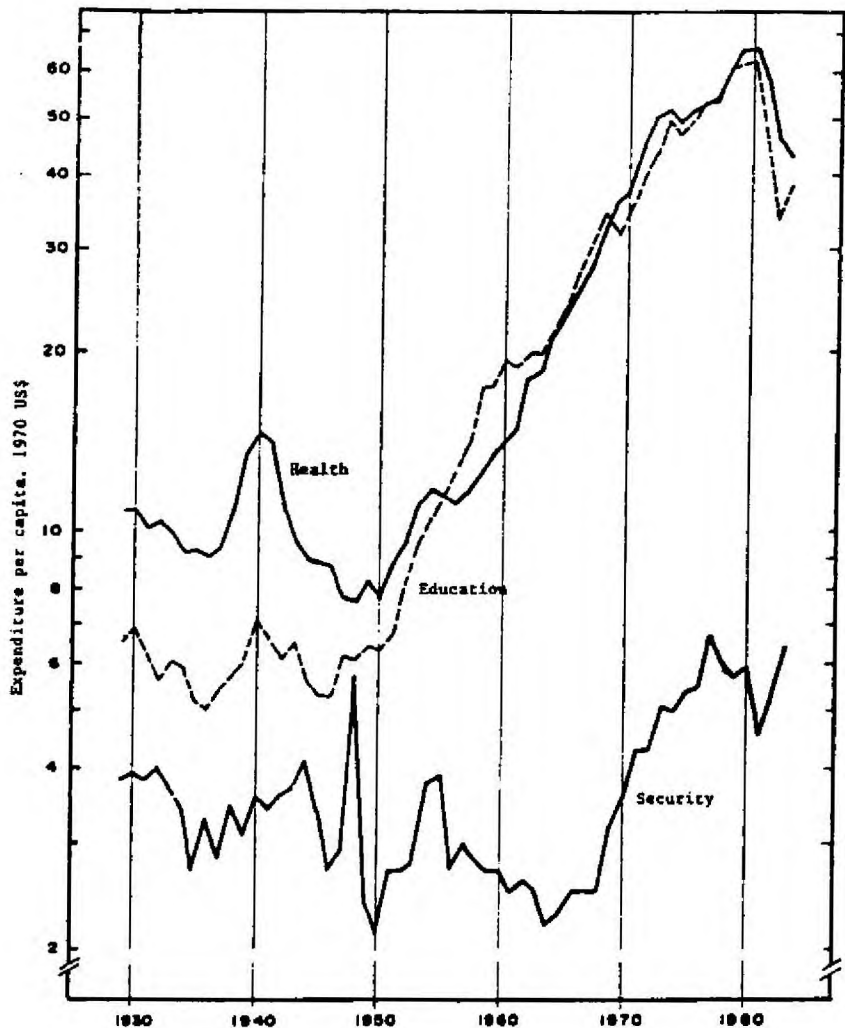


Fig. 3. Public expenditure per capita in health, education and security. Costa Rica 1929-1983

Table 2. *Infant mortality rate by mother's education. Costa Rica, 1965-1984 (18).*

Years of education	1965-69	1970-74	1975-79	1981-84
	Rate per 1,000			
Total	75	64	22	19
Less than 4	89	83	33	29
4-6	73	56	20	15
7 or more	24	40	16	21
	Relative Risk			
Less than 4	3.7	2.1	2.1	1.4
4-6	3.0	1.4	1.2	0.7
7 or more (referent)	1.0	1.0	1.0	1.0

through sanitation, immunization, health education and other improvements in child care remained paramount in the betterment of child health in the 1970s (9). However the control of premature births and other causes of neonatal death, which requires expensive services, also became important determinants in this period.

#### *The socioeconomic determinants*

Extensive evidence suggests that the economic and social conditions into which children are born strongly influence their survival. Consequently, infant mortality has been used frequently as an indicator of the standard of living. Poverty, ignorance, isolation, lack of basic services, and excessive fertility may make children more vulnerable to disease as well as hinder access to, or reduce the efficacy of, medical services.

Figure 2 shows that the two only periods of sustained economic growth in this century, according to the curves of foreign trade, were 1945-1954 and 1965-1979, just when Costa Rica presented the sharpest reductions in adult mortality and infant mortality, respectively. In addition, during periods that correspond approximately to economic crises (the vertical lines in Figure 2 indicate the approximate starting year of a recession), the pace of reduction in mortality slowed down. Since 1980 marked the beginning of a new economic recession it is not surprising that infant mortality became less steep about this time.

Nevertheless, mortality decline in Costa Rican has not been related primarily to economic trends. Indeed, economic factors can not explain the decrease in mortality during the first half of the twentieth

century. Despite of economic stagnation, mortality rates decreased substantially from 1910 to 1949 (Figure 2). Improvements in education and public health, and adoption of new treatments or preventive techniques seem to have influenced mortality independently of economic situation.

Striking characteristics of Costa Rica's history are its renunciation to have an army and the emphasis given to quality of life aspects of development, including education, freedom, tolerance and equity. By keeping expenditures in defence and security low, this comparatively poor country has managed to invest substantially in education, health and other social sectors (Figure 3). A civil war in 1949 consolidated this model of development. The social-democratic party has dominated the political setting since then, even though it has been in the opposition in three four-year presidential periods (10).

The education of mothers is one of the most clearly identifiable determinants of infant mortality (11). As a consequence of improvements in children's schooling in the 1940s and 1950s, the percentage of women with complete primary education rose from 17% in 1960 to 65% in 1980. The effect of educational improvements must not be overstated, however. Recent evidence shows that the differences in child survival by educational level has decreased (Table 2). Health achievements of well educated sectors has diffused to those less educated. The relationship between education and infant mortality has thus been partly neutralized. The programs of primary health care (especially home visits of health workers) gave access to poor and low-educated mothers to the knowledge about causes of diseases and their prevention.

The reduction of socioeconomic and geographic differentials in infant mortality is an outstanding fea-

Table 3. *Infant mortality rate in Costa Rica and San José, 1920-1983.*

Period	Rate per 1,000		Difference CR/SJ	Ratio CR/SJ
	Costa Rica	San José		
1920-29	187	158	29	1.18
1930-39	154	111	43	1.39
1940-49	115	77	38	1.49
1950-59	81	54	27	1.50
1960-69	71	48	23	1.48
1970-79	40	30	10	1.33
1980-83	19	20	(-1)	0.95

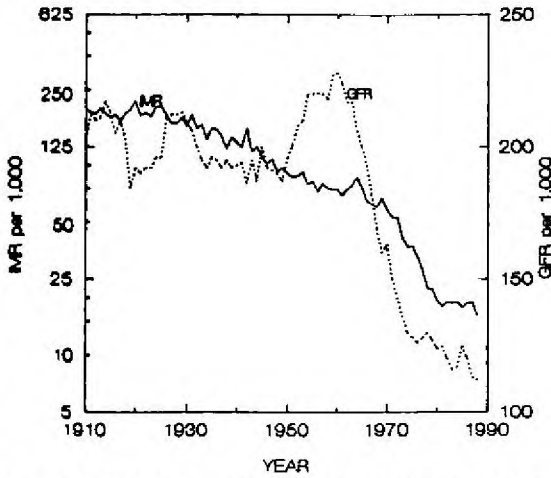


Fig. 4. Infant mortality (IMR) and general fertility (GFR) rates

ture of the 1970s. The comparison of the capital city with the country as a whole in Table 3 shows that a homogenization process indeed took place in Costa Rica. Until the 1970s the infant mortality rate in the capital city, San Jose, was clearly lower than the national rate, but after 1980 the contrary is true.

Apart from social and economic factors, the rapid decline in Costa Rican fertility is probably another factor for the 1970s child health improvement. Between 1960 and 1975 the general fertility rate almost halved – a reduction rarely observed in such a short period (Figure 4) (12). Using standardization techniques, Sosa (13) has estimated that the reduction of high order births is responsible for 24% of the decline in the Costa Rican infant mortality rate between 1960 and 1977. Decreasing fertility reduces the proportion of children born after short birth intervals, in extreme maternal ages and from grand multiparae, whose risk of death is higher. Even though the fertility decline in Costa Rica did not reduce the proportion of teenage pregnancies, it did result in an increase in birth intervals and a remarkable reduction in higher order births.

Nevertheless the overwhelming evidence of the favorable effect of fertility control on child survival, the causal links for this relationship are not well understood. Two frequently mentioned mechanisms are: 1) maternal depletion and 2) sibling competition for scarce family resources and maternal care including breastfeeding (14). The former mechanism refers to the possibility that a rapid sequence of pregnancies and periods of lactation, as well as the own growth of a teenage mother, erodes the nutri-

tional status of the mother and the fetus. Another probably important, but little studied, causal link is the effect of "birth crowding" (15); i.e. the increased probability of transmission of infections at young ages by the presence of infected individuals in the household. Conscious and unconscious infanticide has been also sorted out as a possible link between high fertility low child survival, especially under conditions of severe resource constraints (16). Several indirect mechanisms have been postulated as well, such as improvements in maternal and child health programs made possible by savings from prevented births, changes in the social composition of birth cohorts, and the targeting of some family planning programs on preventing high risk pregnancies (17).

To get an idea of the impact of socioeconomic changes on infant mortality, Figure 5 compares the observed infant mortality rates with the expected for the country's level of social and economic development (6). Seven economic and three social indicators were translated into a theoretical indices of level of development using "correspondence relationships" from a transnational model. Expected infant mortality rates were then determined based on this correspondence relationships and the average of those indexes. The results of this somewhat simplistic exercise confirm that Costa Rica is more advanced socially than economically. The expected infant mortality rate, according to the level of economic development, is, indeed, higher than the rate that corresponds to the level of social development. The infant mortality rate observed until 1970 is intermediate between the two expected rates, and its trend is consistent with the general advancement of the country. Between 1970 and 1980, however, the ob-

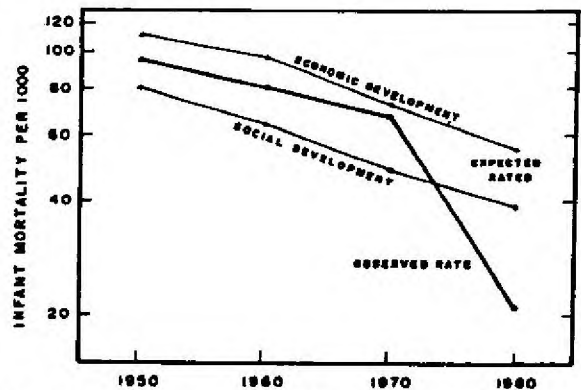


Fig. 5. Infant mortality rates in Costa Rica 1950–1980 (Expected rates according to economic and social development)

Table 4. Indicators of public health interventions in Costa Rica, 1970 and 1980.

Indicators	1970	1980
<b>Public Health Expenditures:</b>		
US\$ per capita	30	155
Percentage of GDP	5.1	7.6
<b>Health facilities:</b>		
Hospital beds per 10,000 people	41	33
<b>Health manpower:</b>		
Physicians per 10,000 people	56	78
<b>Health Organization:</b>		
Population with health insurance (%)	39	70
<b>Hospital care:</b>		
Discharges per 1,000 people	111	117
Births in hospitals (%)	70	91
<b>Secondary Care:</b>		
Outpatient consultation per capita	2.0	2.9
<b>Primary Care:</b>		
Population with domiciliary PHC (%)	0	60
Children 1-4 years with measles vaccine (%)	0*	91
Population with piped water (%)	75	84

served reduction in infant mortality (69%) turns to be approximately three times the expected reduction (20 to 25%). Since socioeconomic change can explain only a third of the observed reduction, a tentative conclusion is that the health policies of the 1970s may be primarily responsible for the infant mortality decline in these years.

### HEALTH INTERVENTIONS

The first national health plan in Costa Rica was implemented in the 1970s, with public resources for the health substantially increased in this decade. Expenditures in public health increased from US \$30 per capita in 1970 to US \$155 in 1980. Their contribution to Gross Domestic Product raised from 5.1% in 1970 to 7.6% in 1980 (Table 4).

Public health programs in the 1970s fell in two categories: 1) primary health care for population sectors not previously served, and 2) extension and improvement of medical services (some highly specialized) under the Social Security System (5).

Primary health care (PHC) services started in rural areas in 1972 and in some urban areas in 1976. In 1980, 60% of the population was covered by domiciliary PHC services provided in quarterly home visits by a health worker. Immunizations against po-

liomyelitis, diphtheria, pertussis, tetanus and measles reached 95% of children. Sanitation activities were intensified, particularly in rural areas, and community participation in local health programs was encouraged. According to the 1984 census, 96% of households had a system of sewage disposal and 87% had piped water (2).

In order to improve medical services, the hospitals of the Ministry of Health (often poor in resources and offering deficient services) were transferred to the social security system. Insurance coverage for illness, which is provided by the social security system, had reached 70% of the population in 1980. This agency doubled the number of centers offering outpatient services and tripled the amount of physician-hours hired between 1970 and 1980.

A regression analysis has modeled the effect of health interventions and other factors on infant mortality based on ecologic data for the 79 "cantones" (counties) of Costa Rica. The dependent variable in this analysis was the relative decline in the infant mortality rate from 1972 to 1980. The explanatory variables were socioeconomic development, fertility regulation, hospital care, secondary health care

Table 5. Coefficients of association (simple *r* and *Beta*) with the infant mortality decline from 1972 to 1980.

Independent Variables	Bivariate Correlation (simple <i>r</i> )	Multiple Regression	
		Beta	F ratio
<i>Situation Circa 1970</i>			
Infant mortality	.31	.49	8.3
Socioeconomic status	-.22	.67	8.0
Fertility control*	-.16**	.38	5.9
Hospital care	-.23	**(-.17)	(0.8)
Secondary care	-.18**	**(-.02)	(0.0)
Sanitation	-.14**	**(.19)	(1.0)
<i>Change in the decade</i>			
Socioeconomic progress	.17**	.27	3.7
Fertility reduction	.27	.29	6.3
Hospital care increase	.30	**(.12)	(0.4)
Secondary care increase	.38	.33	11.1
Primary care increase	.42	.52	10.1
All (Multiple <i>R</i> )		.64	7.0

N = 79 cantons.

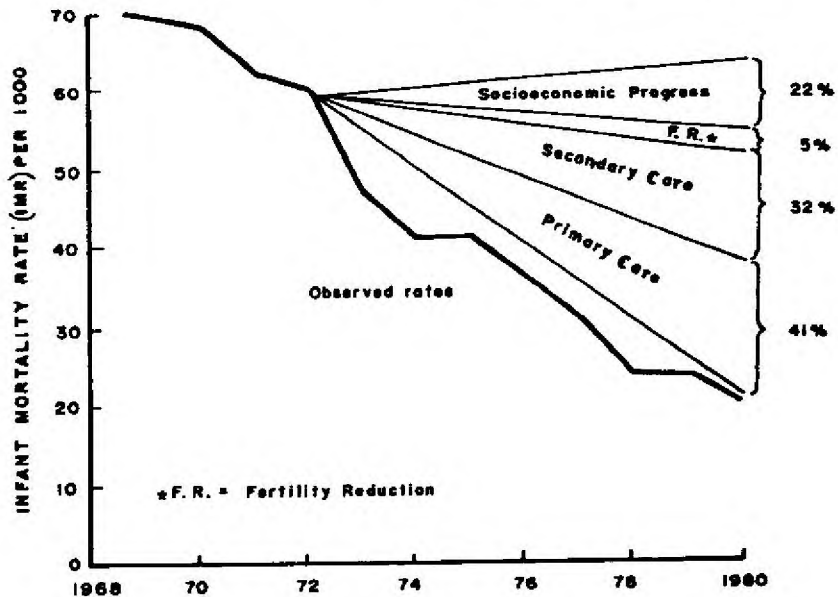
\* General fertility rate with negative sign.

\*\*Not significant at the .05 confidence level.

The Beta coefficients were estimated excluding these variables of multiple regression. In parentheses: values if they would had been included as the eight independent variable.



Fig. 6. Components of the decline in IMR Costa Rica, 1972-1980



(outpatient services) and primary health care. The regression analysis included two indicators for each of these explanatory variable: a cross section of their level by 1970 and their change during the 1970s. Table 5 presents the results of this analysis (9)

The relative decline in infant mortality was negatively associated with the five variables measuring levels in 1970, taken one at a time (bivariate correlation in Table 5). This result indicates that the privileged cantons that had the best living conditions up to 1970 showed the smallest decrease in infant mortality during the 1970s. In other words, mortality differentials were neutralized and the former order of development, i.e., the accumulation of the greatest achievements in a few privileged regions, was altered by new factors. When the improvements in health services during the 1970s were included in the multiple regression model, the indices of status in 1970 no longer showed a negative association. This result suggests that the negative correlations originally observed were product of the targeting of health programs in less privileged cantons.

The Beta coefficients in Table 5 suggest that the change in primary health care was the most influential factor for the infant mortality decline (Beta=0.52). The index measuring PHC included coverage of rural and community health programs, vaccinations, community participation, and water supply. The ranking of other changes independently correlated with infant mortality is: secondary care

(Beta=0.33), fertility regulation (Beta=0.29), and socioeconomic progress (Beta=0.27).

Based on the results of the multiple regression, Figure 6 presents an estimate of the contribution of each variable to the relative decline in infant mortality rate. The expansion of primary health care activities accounted for 41% of the decline in infant mortality rate from 1972 to 1980. Improvements in secondary medical care (outpatient consultations) accounted for 32%. Socioeconomic progress contributed 22% and the decline in fertility only 5%. Fertility played a small role because it was already low in many cantons, and actually rose in almost half of them. This analysis did not take into account the effect of decline in fertility or the socioeconomic advances prior to 1970.

The preceding analysis was replicated in groups of cantons categorized according to both level and trend in infant mortality. The contribution of primary health care was most marked in cantons with high mortality around 1970. In cantons where infant mortality had been relatively low, the reduction was brought about by improvements in secondary health care. Socioeconomic progress affected the different groups of cantons similarly, and fertility reduction influenced only those with a high initial mortality.

A previous study had showed that cantons in which primary health care coverage was 75% or greater experienced a fall in the infant mortality rate from 80 to 17 per 1,000 in the 1970s, while those in

which coverage was practically nil showed a smaller decline, from 49 to 21 per 1,000 (6).

### CONCLUSION

The outstanding level of health in Costa Rica is a historical product of political and socioeconomic circumstances, as well as of public health interventions. However, the breakthrough in the infant mortality rate in the 1970s seems to have been precipitated mainly by health interventions, notably the primary health care program. Ecological data and other evidence suggest that up to three fourths of the decline was accounted for contemporary improvements in public health services, with about 40% attributable to primary health care. Furthermore, by targeting interventions on the less privileged population, primary care had the merit of reducing geographic and socioeconomic differentials in child mortality.

Costa Rica experience shows that, while socioeconomic development is an important determinant of infant death, health interventions aimed at controlling infections can effectively overcome this determinism.

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#### Address:

Luis Rosero-Bixby  
INISA  
University of Costa Rica  
San José  
Costa Rica