Arch Public Health
2001, 59, 151-165

The Effects of the Family Health Program on child health in Ceará state, northeastern Brazil

by

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Abstract

Background: *Based on the targets of the 1985 WHO conference "Health for all", the Family Health Program is being implemented in Ceara State, in the poor northeast of Brazil. Since 1994, increasing numbers of Family Health Teams are developing actions on health promotion, preventive measures and curative care.*

Aim: *This study intended to assess the effects of the Family Health Program on child health in Ceara over a period of five years, in terms of infant mortality rate (IMR), low birthweight, vaccination coverage, prenatal care, exclusive breastfeeding, monthly weighing, and completion of DTP vaccination at the age of one.*

Method: *Group A (n = 20) consisted of municipalities participating right from the start in 1994-95, with a coverage of at least 60% of the population, while group B (n = 22) consisted of non-participating munici-*

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palities which had not started to implement the program by the end of 1998. Group differences were tested using simple linear regression with SPSS 8.0. A comparison of health and preventive health indicators was made, using number of inhabitants as a weighting factor in the regression analysis.

Results: *Both group A and B showed significant decreases in IMR during he period 1994-1998, 54.7% and 51.9% respectively. The proportionate infant mortality showed a relative decline of 49.2% in group A and 45.5% in group B. The differences between group A and B were not significant however. Analysis of the influence of socioeconomic group characteristics on the IMR revealed a moderate significant inverse correlation with garbage collection (B = – 0,46, P = 0,01). With respect to the causes of IMR, group A showed a significant reduction in the diarrhea related component of IMR. Preventive health indicators in both groups showed similar relative increases in participation in prenatal care and exclusive breastfeeding. Both groups showed about the same rates of vaccination coverage and monthly weighing in 1998, although group B had started from lower rates in 1994.*

Conclusion: *Both group A and B showed spectacular relative decreases in IMR in the period 1994-1998. Participation in the Family Health Program in Ceara did not lead to significant improvements in child health indicators as compared to no participation. Analyses of the specific causes of infant mortality showed that group A had a significant reduction in the diarrhea related component of IMR.*

Keywords

Infant mortality, Brazil, Family Health Program.

Introduction

High infant mortality rate is a major concern in northeastern Brazil, including the state of Ceará (population 6.4 million). In the period between 1985 and 1988, the proportion of individuals living below the poverty line in this northeastern region was 52.5%; more than twice as high as in the other regions (1). Under-registration precludes a direct calculation of infant mortality rates in the northeastern region, but there have been estimates as high as 140 per thousand in 1974 (2). Other esti-

mates show it falling from 115 per thousand in 1980 to 80 per thousand in 1988, compared to less than 50 per thousand for the rest of Brazil (3). Generally speaking, this kind of decline could be partly attributed to an improved socioeconomic situation (4). More recently, however, it has also been seen to occur, in the state of Ceará, unaccompanied by improving socioeconomic standards, and is therefore thought to be due to changes in preventive and curative medical interventions (5).

Nevertheless, the infant mortality rate in the state of Ceará remains unusually high, at 68 per thousand in 1990(6). In addition to poor socioeconomic conditions and inadequate or absent medical attention in the rural areas of Brazil, there have been more culturally oriented explanations. Because of the large families with numerous children dying, mothers are thought to have adopted a stoic and neglectful attitude towards their children (7, 8). More thorough research has made this explanation very unlikely; it is most probably only a superficial attitude, based on popular beliefs (9).

An assessment in the early 1970s revealed that the region had only 1.84 beds and 0.3 physicians per 1000 inhabitants, which is extremely low compared to the theoretically recommended 4.5 beds and 1 physician. Moreover, of the 141 towns in the region, 62% had no hospital, and there was an uneven distribution of physicians; 78% of the physicians were concentrated in the capital of the region (where the availability is 1.1/1000 inhabitants) (10). Although there have been improvements over the years, it is still the poor and uneducated who suffer the highest infant mortality rates (11). These mortality rates are not exclusively due to non-medical factors like poor hygiene or malnourishment, but also to lack of medical attention (5).

A closer look at the causes of infant mortality shows that after perinatal problems (43%), diarrheal disease (25%) is a prominent factor (20). Although prevention of this disease is rather difficult, treatment in most cases is not. Notwithstanding the high prevalence of diarrheal diseases, oral rehydration therapy (ORT) is insufficiently used (16). Some experts have therefore wondered why ORT has not been distributed via the traditional and lay health system, but is restricted to administration by doctors (17). Others have made suggestions for hygiene and health education to the poor community in order to prevent diarrhea (18), but these have not yet been implemented.

Child malnutrition, though decreasing, is still a major problem; the prevalence of child malnutrition was still as high as 12.8% in 1989, which

is more than three times the figure for the southern regions of Brazil (21). Hence, the state government, with financial support from the World Bank, established 34 nutrition centers in 1992-1994. These centers were to give training courses on nutrition to staff and community health workers, treat malnourished children, and educate the community to prevent malnutrition. Their effectiveness, however, was found to be low (19). From 1989, a major campaign has started to provide every hundred families with a so-called health agent, a community member who receives a brief training on the subjects of prevention and health promotion. The health agent urges pregnant women to attend prenatal care, weighs the children at birth and then monthly to the age of two years, educates mothers on the subject of breast-feeding, hygiene, and ORT, accompanies sick people to the hospital, etc. This has led to improved health monitoring and easier access to health care facilities. This approach points the way forward to a further upgrading of the general health care system, in order to ameliorate child health.

The re-formatting of the national health care system, in accordance with the principles of the 1985 WHO targets for health for all, has culminated in the creation of the Family Health Program. This is an initiative of the Brazilian Ministry of Health that emphasizes health promotion, prevention and education. The state of Ceará financially encourages municipalities to participate in the program on a voluntary basis. Most of the costs are borne by the state government, but some of the costs have to be covered from the municipalities' own resources. In 1994, the first Family Health Teams were formed to work mainly in the rural areas. Each team includes a general practitioner, a nurse, and an auxiliary nurse, who complement and collaborate with the existing network of community health agents, of whom each team includes ten. This scheme has since been fully supported by the state government of Ceará. Each team is responsible for a well-defined area with around 1000 families (4500 people), and identifies local health risks in the area on which it focuses its actions. These actions are planned jointly with the population and other sectors of the municipal society. Actions are developed on health promotion and preventive and curative care (15).

This is the most recent initiative to improve the poor health situation in the city slums of Fortaleza and the rural areas of Ceará, and to develop a firm basis for a general health care system.

Research question

The aim of the present study was to evaluate whether the Family Health Program initiative is effective enough to deserve being extended

and recommended for application in other developing countries. The study intended to assess whether the Family Health Program (FHP) in the State of Ceará had improved child health between 1994 and 1998, in terms of infant mortality, low birthweight, vaccination coverage, prenatal care, exclusive breast-feeding, monthly weighing, and completion of DTP vaccination at the age of one. For this purpose, a group of municipalities that had participated in the program was compared with a group that had not. Both groups of municipalities were assessed for the effects of the program on the above health parameters over a period of five years.

Methods

Setting

Although vital statistics are of paramount importance for health care planning and program evaluation, few Brazilian states have registration systems for such statistics with either sufficient coverage or the ability to achieve these goals. Often, no reliable data are available for a number of child health indicators such as nutritional status, breast-feeding, incidence and management of infectious disease, coverage of antenatal and perinatal services, and growth monitoring (12).

It was decided to assess the influence of the FHP on child health in Ceará by combining a number of available indicators; infant mortality rate, proportionate infant mortality, low birthweight and vaccine coverage. The most prominent causes of infant mortality, viz. perinatal causes, diarrheal disease and respiratory infections, were also evaluated as to what shares they had in overall infant mortality, and how these changed over time. The reason for choosing infant mortality rate as a parameter to evaluate the FHP is that infants are particularly quick to respond to changes, and should have had the greatest benefits from a new family health policy, since they normally enjoy such benefits from the moment of birth and through early childhood, when mortality is relatively high.

We compared two groups of municipalities in Ceará, selected from a total of 182. The first group, that of participating communities, had to have participated in the project right from the start in 1994-95, with a coverage of at least 60% of the population (group A, n = 20). The other group, that of non-participating communities, had not started to implement the program by the end of 1998 (group B, n = 22). The main difference between groups A and B lies in the addition of a first-line physician and a profes-

sional nurse to the yet existing network of health agents. The physician attends to all patients in need of first-line medical assistance, both in consulting hours and house visits, and refers to a regional or central hospital. Otherwise he collaborates with and gives extra trainings to the health agents, and is engaged in prevention and health promotion by identifying local health risks, with other parties involved. In both groups hospital services can be found in the municipality itself, or when very small, in a nearby municipality.

Data

Data was derived from a range of sources. Routinely collected data was obtained from the State Secretariat of Health, which controls the information system on primary care, SIAB. This data is collected by PACS (Programma de Agentes Communitarios de Saude), which records information on living conditions, health promotion and prevention, antenatal care, weight monitoring, breast-feeding, infant mortality (specified as to whether it was caused by diarrhea-related diseases, acute respiratory infection or neonatal causes). The information is obtained by house surveys undertaken by the community health agents. Data on vaccination coverage was collected from the SI-PNI national immunization program. Socioeconomic data, including the number of inhabitants per municipio, per capita income and urbanization rate, was obtained from IPLANCE (Instituto de Planejamento).

Definitions

Infant Mortality Rate

Infant mortality is defined as mortality under the age of one, expressed as the number of deaths per thousand live births. This can be divided into neonatal mortality, i.e., from birth until the age of 27 days, and post-neonatal, i.e. from 28 to 365 days of age. Neonatal mortality is primarily caused by perinatal causes such as prematurity, problems related to the partus itself and congenital malformations. Post-neonatal mortality is largely caused by infectious diseases. Because of its etiology, neonatal mortality is more difficult to prevent than post-neonatal mortality. The latter can be prevented by specific interventions such as immunizations and the treatment of, for example, diarrhea or pneumonia, although it is of course also sensitive to improvements in nutritional and sanitary conditions, and the socioeconomic situation as a whole. In countries with

a well-developed health care system, post-neonatal mortality is low, while neonatal mortality is relatively high.

Proportionate infant mortality

This is the infant mortality rate compared to the total mortality, expressed as a percentage, allowing one to distinguish how changes in child health are related to those in the population as a whole. Because of the under-registration of mortality in general, the evaluation of infant mortality as a percentage of the total mortality is a more reliable parameter.

Low birthweight

This is defined as a weight at birth below 2500 grams. There is a close relation between low birthweight and the incidence of early childhood diseases, such as pneumonia (13) and other infectious diseases, and the consequent mortality (11, 14). The percentage of low birthweight is calculated by dividing the number of cases by the total number of registered births, excluding those that are not weighed.

The recorded percentages are generally assumed to be too low. A reason for this under-registration is that women with complications in the prenatal history are being sent to the capital for delivery, because of the absence of adequate equipment and intensive care units in the small municipal hospitals.

Vaccine coverage

The percentage of vaccine coverage is calculated by dividing the number of one-year-old infants that have completed their DTP (diphtheria, tetanus and pertussis) vaccination by the total number of one-year-olds. Because the last census was held in 1991, almost ten years ago, the number of inhabitants per municipality has been corrected by annual estimations of the growth of the population. In reality, the population has grown faster than estimated. There have also been major shifts in the population, with people moving to other regions of Ceará in dry periods, shifts that are unaccounted for in records.

This explains why the percentage of vaccinated children has at times been found to be higher than one hundred percent. Another reason for this artifact could be that during the major vaccination campaigns, children are sent over from other, nearby municipalities and are then recorded as

being vaccinated in the municipality where the vaccination is taking place. In these cases, the percentages have been corrected to hundred percent.

Components of infant mortality

The most prominent causes of infant mortality, viz. diarrheal disease and respiratory infections, were assessed over time in terms of absolute mortality and relative shares in infant mortality as a whole. The registration of neo-natal causes of infant mortality by PACS had not yet started in 1994; this information was available only from 1996 onwards.

TABLE 1
Socioeconomic characteristics

Group	A (n = 20)	B (n = 22)
Number of inhabitants	22.436	17.331
Urbanization rate (%)	46.64	42.14
Municipal production per capita (Reais)	1312.35	1060.61
Literacy rate > 15 years (%)	62.95	56.23
Connected to public water supply (%)	35.01	40.99
Only untreated water available (%)	22.34	33.49
Sanitation (%)	6.95	3.60
Garbage collection (%)	38.09	22.04
Connected to electricity grid (%)	70.21	59.54

Statistics

Information on socioeconomic and health parameters was not available at an individual level but only at municipal level, and has been evaluated as such. Descriptive analysis was performed using Epi-info 6. Effects of the intervention were tested using simple linear regression with SPSS for Windows 8.0.

A comparison of health and preventive health indicators was made between group A, which had entered the FHP in 1994/95, and group B, which had not yet entered the FHP at the end of 1998. The differences between 1994 and 1998 were used to calculate new scores on variables, representing the changes in the following indicators: infant mortality rate, proportionate infant mortality, diarrhea-related and acute respiratory infection related components of infant mortality, and low birthweight. The same was done for the following preventive health indicators: prenatal care, exclusive breast-feeding during the first 4 months, monthly weighing, and completed DTP vaccination at age one. These new scores were subsequently used as the dependent variables in linear regression

analyses. Participation or no participation during the period between 1994 and 1998 (group A/B) was used as the independent variable. The regression analysis used the number of inhabitants as a weighting factor. All P-values < 0.05 were considered significant.

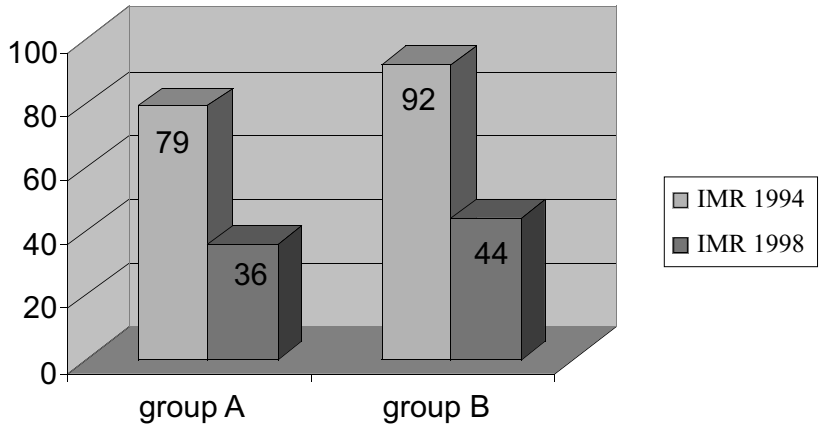

Fig. 1: Infant mortality rate 94 – 98 (per 1000)

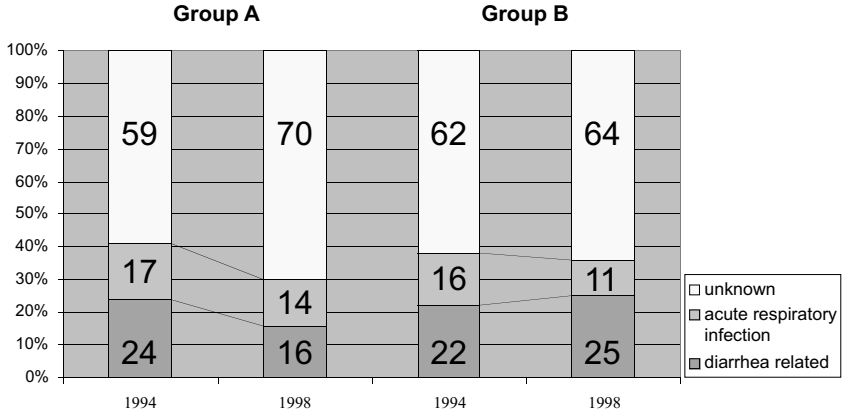

Fig. 2: Infant mortality, in components, specified by cause (in percentages)

Results

In the period from 1994 to 1998, both groups showed a significant decline in infant mortality rates (figure 1), corresponding to relative decreases of 54.7% in group A and 51.9% in group B. The difference between A and B, however, is not significant. The same is true after correction for possible under-reporting of mortality: the proportionate infant

mortality showed a relative decline of 49.2% in group A and 45.5% in group B; the difference between A and B was not significant either.

An analysis of the influence of the socioeconomic group characteristics on the IMR, weighted for the number of inhabitants per municipality, revealed a moderate inverse correlation between infant mortality rate in 1998 and garbage collection (B = – 0.46, *P* = 0,01), and a borderline significant inverse association with mean per capita municipal production (B = – 0.278, *P* = 0.09) and the availability of electricity (B = – 0.375, *P* = 0.09).

As regards the causes of infant mortality, group A showed an 8% (p = 0.049) decrease in the diarrhea-related component, whereas group B showed a small increase of some 2%, which was not significant (table 2). The percentage of children with low birthweight remained almost unchanged in group A, while showing an unexpected increase in group B (p = 0.001).

The reported percentages of 5 to 6% are too low, however, to fit in with the actual figures, which must be due to under-reporting. At the same time, the percentage of children under the age of one that are being weighed every month had more than doubled.

The preventive health indicators (table 3) showed almost the same increase in both groups, although group B had started from a less favorable situation. The two groups showed an almost equal relative increase in participation in prenatal care, and in the exclusive breast-feeding of children to an age of four months. Both groups showed about the same rates of vaccination coverage and monthly weighing in 1998, even though group B had started from lower rates in 1994.

TABLE 2
Health indicators

Group	A (n = 20)	B (n = 22)
Infant mortality rate in ‘94 (IMR 94)	78.97	91.72
Infant mortality rate in ‘98 (IMR 98)	35.75	44.15
Proportionate infant mortality in ‘94 (%)	33.35	37.67
Proportionate infant mortality in ‘98 (%)	16.95	20.52
Diarrhea-related component of IMR in ‘94 (%)	24.15	21.76
Diarrhea-related component of IMR in ‘98 (%)	15.70	24.91
Acute respiratory infection component of IMR in ‘94 (%)	16.80	15.57
Acute respiratory infection component of IMR in ‘98 (%)	13.90	11.17
Neonatal component of IMR in ‘98 (%)	47.25	37.22
Birthweight < 2500 grams in ‘94 (%)	6.67	3.27
Birthweight < 2500 grams in ‘98 (%)	6.29	5.79
Below p10 at age 1 year in 98 (%)	11.25	16.65

TABLE 3
Preventive health indicators

Group	A (n = 20)	B (n = 22)
Prenatal care in '94 (%)	76.10	59.33
Prenatal care in '98 (%)	86.65	69.96
Breast-feeding first 4 months in '94 (%)	40.45	31.62
Breast-feeding first 4 months in '98 (%)	55.15	45.52
Weighed every month < 1 year in '94 (%)	70.25	42.71
Weighed every month < 1 year in '98 (%)	93.95	93.39
DTP completed at age 1 year in '94 (%)	86.90	75.44
DTP completed at age 1 year in '98 (%)	98.90	98.03

Discussion

This analysis of the influence of the Family Health Program in Ceará on child health did not show that participation in this program led to significant improvements in child health indicators in the period 1994-1998, compared to no participation. Although the participating group (A) started with a lower infant mortality rate (IMR), both groups showed more or less the same spectacular relative decrease in IMR. Analysis of the specific causes of infant mortality shows that group A had a significant reduction in the diarrhea related component of IMR.

Because of its methodological setup, this analysis provides no firm basis for valid conclusions as to whether the FHP has a significant beneficial effect on child health as a whole. It does, however, give rise to some unexpected observations. A paradoxical outcome is the increased percentage of low birthweight in group B. This does not fit into the general trend of improving health parameters, and is therefore probably an artifact caused by incorrect registration. It is possible that increased resources meant that smaller, more distant communities, which are difficult to reach by road, were also becoming included in the PACS program, and that the people of these communities, who are living in less favorable economic and health-care conditions, might be more prone to having children with low birthweight.

Although the 1998 IMR was lower in the group that had participated in the program, the relative improvement in the various child health indicators was equal to that in the group of municipalities that had not participated. Some changes were probably owed to the FHP, for instance, the sharp decline in diarrhea-related deaths as a component of infant

mortality in the participating municipalities. The reason might be, as other authors (16, 20) have also suggested, that the prescription of ORT is still seen as a medical treatment, and thus to a certain extent restricted to administration by doctors, in this case the doctors who were active in the FHP.

Paradoxically, the implementation of the FHP has not prioritized those municipalities that were most in need of more intensive health care services, i.e. those with the highest infant mortality rates. A comparison between the two groups reveals major differences in a number of socioeconomic variables, showing that our assumption that the choice for implementation would be a purely political one, was unjustified. Implementation of the FHP proved to be more common in municipalities with larger numbers of inhabitants. This, in combination with higher incomes, gives rise to higher municipal tax revenues. Thus, the local prefect and health secretary have more funds from which to pay the obligatory municipal share in the FHP costs.

Another difference between the groups was that in the literacy rate, which was slightly in favor of group A. Literacy is usually regarded as a measure of the general level of education, and an educated and self-aware community is more likely to demand that preventive measures for the benefit of public health are implemented by the authorities responsible. Another factor is that municipalities with fewer inhabitants and a more rural character are more likely to include areas that are difficult to reach because of the poor state of the roads. Few health care professionals are willing to work and live in such circumstances.

Many of the variables remain unknown. The present analysis only includes information on quantitative aspects of the FHP involvement. The number of FHP teams per municipality and the years during which they are active does not give any information about the actual functioning of the program. A functioning FHP implies more than the mere presence of all health care professionals involved. Their professional skills, their efforts towards an inventory of health risks and local preventive measures, the way they function in a team and their relations (as regards referral) with other health care professionals cannot easily be measured. The participating physicians are not required to meet special training standards or take extra courses, as specialized training courses for family medicine have only recently been introduced. Because of the great demand for doctors to participate in the FHP, recently graduated doctors without clinical experience are being accepted to work in this program without supervision.

Even in 1998, infant mortality rates in the group of municipalities that participated between 1994 and 1998 (group A) varied widely, ranging from 25.7 to 62.5. Whether qualitative differences in the implementation of the FHP are responsible for this cannot be concluded from the available data. Answering this question would require local studies investigating the qualitative aspects of local health care.

The PACS (community health care workers' program), which started in 1987, has led to huge changes and its extended and improving services are still thought to have increasingly positive effects on IMR, health and preventive health indicators. In contrast to the doctors and nurses that have been added since 1994 to form the FHP teams, the PACS health care workers focus largely on the population at risk, i.e., pregnant mothers and their babies. The regular visits and the monthly weighing of the infants create a context for early detection of any serious infant illness and for adequate referral to the local or regional hospital.

The increased vaccination coverage in both groups, to almost 100%, is mainly due to the intensified campaigns that are centrally planned by the State Secretariat of Health.

The present analysis did not try to identify the exact factors responsible for the differences in infant mortality rate between the two groups. It does show, however, that the lower IMR in group A is accompanied by higher percentages of up to date prenatal care and exclusive breastfeeding till the age of 4 months, factors that in more extensive analyses have been identified as leading to a significant reduction of IMR (22). A rather unexpected outcome is that the presence of garbage collection showed a significant inverse association with a decreased IMR in 1998. Although it is not difficult to imagine how an improvement in basic hygiene could help to prevent infectious diseases, previous analyses of socioeconomic factors have never found this association. On the other hand, adequate water supply, which has been identified as an important determinant of infant mortality, did not prove to have a significant influence in the present analysis (22).

We have tried to evaluate the effects of a new health care policy on child health at the municipal level, with the help of routinely collected data. We chose to do an analysis at this level, because in Brazil, and many other developing countries, it is often the local government that has to support any structural change, has to approve implementation and is responsible for the effectuation of new health care policies.

In general, child health indicators have been improving in the whole of Ceará. Little information is as yet available on the factors responsible for

this. If effective measures are to be taken towards a further reduction of IMR, these factors will have to be identified at a local level. As was pointed out above, there are major differences at this level, often due to local politics.

There is no doubting the importance of the FHP in meeting the need for a basic health care system for the whole population, which until recently was lacking in Ceará. The present study does not pretend to have evaluated the effects of the program as such. Although the effects of the FHP on the health status of children were found to be small, they nevertheless justify further implementation, as well as further evaluation over time, since the FHP's efficacy can be expected to increase as the parties involved gain further experience.

Acknowledgements

The authors would like to thank all colleagues of the Public School of Health of Ceará for their support and perceptive introduction to the FHP, and the State Secretariat of Health of Ceará for its permission to use their data.

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