

PROSPECTIVE STUDIES OF THE ILLNESS BURDEN IN A RURAL COMMUNITY OF NORTHEAST BRAZIL^{1, 2}

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This work documents the frequency and nature of common illnesses over 18 months among 48 households in tropical Northeast Brazil. Led by respiratory and diarrheal illnesses, and complicated by anorexia and nutritional setbacks, these illnesses constitute major health problems and are the appropriate focus of renewed efforts aimed at their control.

Introduction

The high illness burden of poor populations in developing regions severely affects their health status. Children tend to be the most vulnerable, the combined interaction of malnutrition and infectious diseases being the leading source of morbidity and mortality among them, with enteric and respiratory tract infections accounting for the vast majority of the communicable illnesses involved (1-6).

Though all this is well-known, there have been few community-based morbidity studies permitting precise age-specific illness rates among poor populations in developing areas to be determined. That is unfortunate, because measure-

ments of disease incidence are important for control efforts. For example, control programs directed at both diarrheal diseases and acute respiratory infections have been or are about to be initiated in many developing nations, with the support of the World Health Organization. These programs' specific objectives, plans for resource use, and apparent impact upon subsequent evaluation will all depend upon the available disease incidence figures (as well as upon mortality data) before the programs are begun.

Within this context, it is worthwhile to consider data obtained from a longitudinal surveillance project for febrile, respiratory, and diarrheal illnesses that was conducted in a rural town in a semi-arid portion of Northeast Brazil

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in 1979-1980. This project provided an opportunity for investigators to assess several major parameters of acute morbidity in three distinct populations within the same geographic setting. It also made it possible to estimate the precision of diarrheal disease data obtained at weekly intervals relative to daily records.

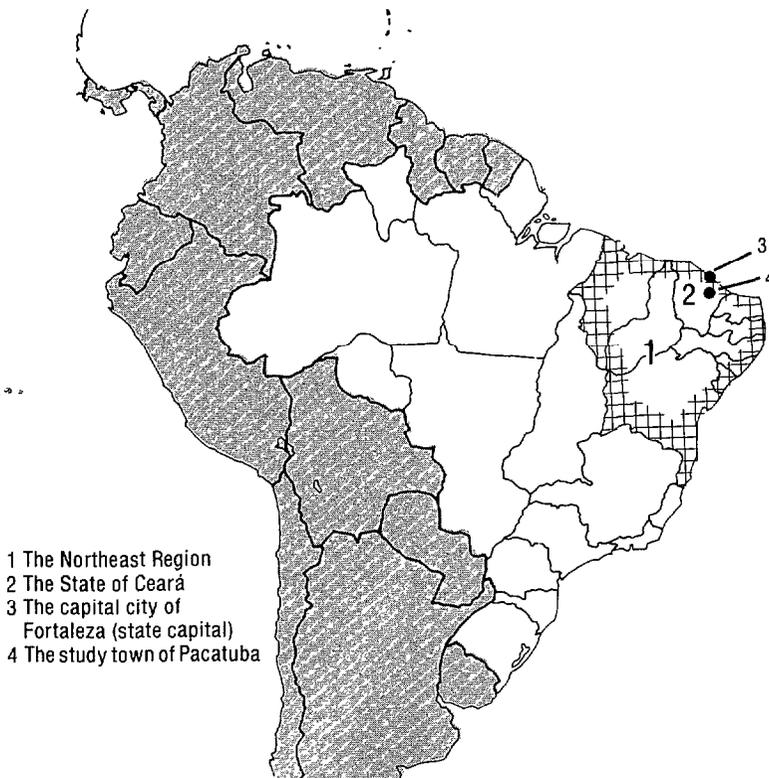
Materials and Methods

During a 78-week period, from January 1979 to July 1980, longitudinal surveillance of selected families and disease symptoms was carried out in the rural Brazilian town of Pacatuba. This town is located 32 km from Fortaleza, capital of the northeastern state of Ceará (Figure 1). In parallel with an ongoing gastroenteritis sur-

veillance project that has been described in detail elsewhere (7), data were collected during weekly visits by members of a surveillance team. The families surveyed lived in one of three distinct neighborhoods. One of these, named São João, is a poor district whose residents maintain their traditional rural ways. Another, named Mata-douro, is located in the town of Pacatuba near São João and is also poor, but is in transition from a traditional rural to an urban lifestyle. The third neighborhood, designated "Centro," is the middle-class district in the town's center.

A student of the health sciences faculty of the Federal University of Ceará, usually supervised by a physician member of the team, made a weekly visit to each survey household. During this visit the mother or guardian of the household was asked to report the presence or absence of

Figure 1. A map of Brazil showing the location of Pacatuba.



Residents of the rural Pacatuba survey area.



illness symptoms manifested by all household members during the past week. No attempt was made to establish the duration of symptoms within the one-week period. Specific gastrointestinal symptoms (diarrhea, vomiting, anorexia), respiratory symptoms (nasal congestion, cough, expectoration, conjunctivitis), and systemic disease symptoms (fever, chills, headache, myalgia) were routinely noted.

For purposes of analysis, the limits of a fever or diarrheal "episode" were defined by the week or succession of weeks in which the symptom of fever or diarrhea was reported by the mother or responsible guardian.¹¹ (Such episodes were bounded by weeks in which the symptom was not reported.) Similarly bounded respiratory disease episodes were defined by the reported presence of cough, nasal congestion, or expectoration—combined with any of the aforementioned systemic symptoms, with conjunctivitis, or with

any other of the respiratory symptoms cited. Naturally, if data were not available for a given week, this absence of data was not taken to signal the end of an episode.

Data were collected from a total of 56 families. In 42 cases the data collected spanned the full 72-week study period, while in 14 cases a shorter period was covered. However, in most cases data were not reported for all the weeks involved; and in some cases the reporting period was very short. Therefore, data from eight families were excluded from the analysis because the data available covered less than 20 weeks or because data were missing for over 30% of the weeks covered.

This left data from 39 families followed for the entire study period and from nine families followed for shorter periods. The 39 families provided data for an average of 65.5 weeks (data being unavailable for an average of 12.5 weeks per family). Six of the nine families followed for shorter periods were added during the study, while the other three families moved away during the study; on the average, data from these nine families were available for 88.5% of the weeks covered.

¹¹The definitions of "diarrhea" and "fever" were subjective, depending on the mother or guardian's judgment; but diarrhea was often confirmed by a marked change in stool consistency (from solid to liquid) accompanied by an above-normal number of bowel movements (more than two per day).

Table 1. Person-weeks of observation of study population members, by neighborhood and age group.

Neighborhood	No. of households	Age group						Total
		<1 year	1 year	2-4 years	5-9 years	10-14 years	≥15 years	
Matadouro	18	182	261	695	1,508	1,256	2,810	6,712
São João	11	282	267	663	617	452	1,521	3,802
Centro	19	78	20	630	1,436	1,387	4,497	8,048
Total	48	542	548	1,988	3,561	3,095	8,828	18,562

The average number of household members in the study families was 6.9 persons. The distribution of person-weeks of observation, by age group and neighborhood, is shown in Table 1. The number of person-weeks of observation in one neighborhood (Centro) for children under two years of age was so small (98 person-weeks) that illness rates were not subsequently calculated for children under two in that neighborhood.

Results

The weeks with reported illness (involving diarrheal, respiratory, or systemic symptoms) per person-year, by age group and neighborhood, are shown in the upper chart of Figure 2. An inverse relationship between weeks with illness and age is evident among subjects over one year old. Also, Chi-square analysis found Centro subjects to have significantly fewer weeks of illness per person-year ($P < 0.05$) than did residents of Matadouro and São João. In contrast, no significant differences were found between the reported overall illness rates in Matadouro and São João. In general, data on study children less than five years old indicated that on the average those in Matadouro and São João were ill during a similar percentage (34.2% and 35.2%, respectively) of the weeks covered.

The rate at which anorexia was reported by the mother or guardian of each household is presented for comparison in the lower chart of Figure 2. As in the case of illness symptoms, an inverse relationship between weeks with anorexia and age is seen among subjects over

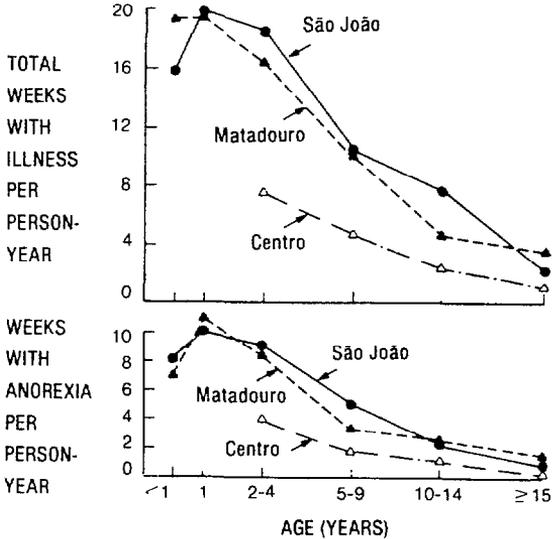
one year old. And again, the average percentage of weeks in which Matadouro and São João children under five were said to have experienced anorexia (16.8% and 17.5%, respectively) were very similar.

Figure 3 shows the reported numbers of febrile, respiratory, and diarrheal disease episodes per person-year, by age group and neighborhood. Combining the febrile illness data (upper chart) for children under five years old, those in Matadouro were reported to experience an average of 6.0 febrile episodes per year, while for those in São João the average was 4.2.

The incidence of reported respiratory episodes is shown in the middle chart of Figure 3. Combining the respiratory illness data for children under five, those in Matadouro were reported to experience an average of 8.5 respiratory disease episodes per year, about the same as the 7.8 episodes per year reported for the São João study children in this age group. Overall, respiratory tract illnesses were the illnesses most commonly reported in the study households.

Regarding diarrheal episodes indicated by these weekly recall data, it was found that the average number of episodes among children in their second year of life exceeded five episodes per year in Matadouro and seven episodes per year in São João. Overall, the average number of diarrheal disease episodes among children under five years old was 5.1 per year in São João and 3.4 per year in Matadouro. As this and the data in Figure 3 indicate, the pattern of diarrheal disease episodes in young children differed somewhat from the other disease patterns in that the diarrheal episodes appeared consistently

Figure 2. Charts showing the reported numbers of person-weeks per year with symptoms of illness (above) or anorexia (below) among subjects in different study neighborhoods and age groups.



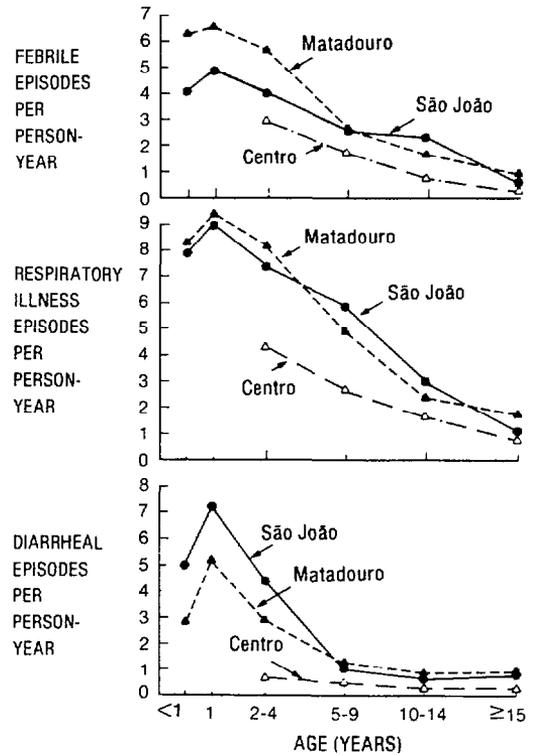
more frequent in the relatively rural area of São João than in the more urban neighborhood of Matadouro.

Discussion

This prospective surveillance project examined the 48 study families' "symptom experience" for a total of 357 person-years, as a measure of acute morbidity in the community. Major differences attributable to age and socioeconomic conditions were encountered. Febrile, diarrheal, or respiratory disease symptoms were reported in approximately one-third of all the study weeks for children between one and two years of age in Matadouro and São João, with the rates dropping steadily thereafter to adult levels.

Previous studies offer data that are interesting but not precisely comparable, having been obtained at different locations using different

Figure 3. Charts showing the reported numbers of episodes of febrile illness (top), respiratory illness (middle), and diarrheal illness (bottom) per person-year among subjects in different study neighborhoods and age groups.



methods. In Bangladesh, on the basis of visits and examinations made every other day, Black et al. reported that illness was present on 75% of the days of observation, on the average, among members of a cohort of 197 rural children from two months to five years old who were followed for one year (8). Martorell et al., using data based on a two-week recall of symptoms among preschool children, reported that selected common symptoms were present on 23% of the child-days involved (9). The differences encountered in these rates partly reflect differences in the intensity of the surveillance—possibly to a greater extent than they reflect actual differences in morbidity levels.

Illness-associated anorexia is felt to be a sig-

nificant contributing factor to malnutrition. Martorell et al. (9), studying a poor Guatemalan population, determined that the intake of young children was diminished by 20% in the presence of symptoms of common illnesses. In our population, anorexia was common among subjects in the first five years of life, appearing most commonly (reportedly being present during 20% of the weeks covered) among children in the two poor neighborhoods who were in their second year of life. With respect to subjects with disease symptoms, anorexia was reported in approximately half of all weeks in which the subject was reported ill.

Working with this same population, Leslie (10) has shown on the basis of weekly weighing that while illness without anorexia was associated with weight loss in 39% of the cases, illness with anorexia was associated with weight loss in 70% of the cases.

The average number of febrile episodes per person-year in children under five was 4.2 in São João and 6 in Matadouro. This compares with frequencies of 6.3, 8.7, and 8.2 episodes in the first, second, and third years of life, respectively, among Mata's Guatemalan cohort (11). In this vein, Black reported that days with fever accounted for 8.7% of all subject-days among his cohort of children two months to five years old, the highest percentage of days with fever (12%) being found among those two to five months old (8).

Respiratory infections (most commonly upper respiratory infections) were the most prevalent illnesses encountered among every age group in our study. This was true despite the fact that our definition of a respiratory illness episode (as an episode with nasal congestion, cough, or expectoration plus one additional symptom) probably excluded many of the milder episodes. In this regard, it is worth noting that Black found the members of his cohort to have upper respiratory infections for an average of 60% of the days studied, while Mata detected averages of 5.9, 7.0, and 6.3 respiratory disease episodes per child during the first, second, and third years of life, with about 40% of the episodes being

attributed to lower respiratory tract infections (8, 11).

Overall, cough was a symptom in the great majority of cases reported in our study. Fever was also a common respiratory disease symptom, being reported in 58% of the episodes among Matadouro children under five years old and in 45% of the episodes among older Matadouro children.

Regarding diarrheal disease, our data showed relatively high rates of diarrheal episodes, especially in the study children one and two years old in Matadouro (5.2 episodes per year) and São João (7.2 episodes per year). Data on the incidence of diarrheal illnesses among the same populations over a longer period of time have been reported previously (7), but these were based upon daily records rather than upon the weekly records used here. The more sensitive daily methods revealed higher annual rates (6.2 and 7.9 episodes, respectively) among Matadouro and São João children one year old (in their second year of life). The difference between the two methods was slightly greater for the Matadouro and São João children under five years of age, who were found to have an average of 4.3 diarrheal disease episodes per person-year by the weekly method and 6.0 episodes per person-year by the daily method.

These differences could be due to any of several limitations upon the precision of data employing weekly intervals. For one thing, data using weekly intervals undercount episodes if multiple episodes occur in the same week or in consecutive weeks. For another, one would expect a certain degree of underreporting due to difficulties the reporting person could be expected to have in accurately recalling an entire household's symptoms for a seven-day period, especially when reporting on the large families included in our study.

Another drawback to using weekly intervals is that they give equal weight to episodes of different lengths occurring within the same number of week-long intervals. (For example, a case of anorexia lasting one day within such an interval would be recorded in the same way

as a case lasting, say, five days within the interval.) This makes it difficult or impossible to tell how long a particular symptom or disease condition tended to persist.

It should also be noted that the study reported here found major differences in the morbidity patterns of different neighborhoods in the same town. That is, while the febrile, diarrheal, and respiratory disease rates in the two poor neighborhoods tended to be fairly similar, the Centro study subjects showed consistently lower patterns of morbidity in all age groups (see Figures 2 and 3). Although the small number of Centro children under two years of age in our study sample did not permit assessment of morbidity in that age group, daily diarrheal disease records previously reported (7) demonstrated large differences between the Centro and other neighborhood populations in this age range that were consistent with the trend detected among older age groups by our survey.

Altogether, the accumulated data on the patterns of Centro morbidity suggest that those patterns are in the range reported for suburban populations in Cleveland, Ohio, and Charlottesville, Virginia, in the United States (12, 13). Whether the rates in the Centro neighborhood and in these

latter areas are actually comparable or whether possible underreporting of mild respiratory illnesses in Centro households falsely reduced the apparent illness rates is unclear. We did note a greater number of weeks without data (reflecting an absence of the mother at the times of weekly visits) in the Centro neighborhood than in the poorer neighborhoods, and also a higher degree of interest and cooperation among the study populations of the poorer neighborhoods.

Before closing, it should be pointed out that the populations of the poorer neighborhoods covered in this study are part of a much larger impoverished population. Specifically, the rural population of Northeast Brazil is over a million, and over 90% of the children in this population belong to families with a per capita income of US\$30 per month or less. There is no reason to suppose that the overall patterns of acute morbidity among this large population differ greatly from those found among the residents of the poor neighborhoods dealt with in this study. Hence, the data reported here provide tentative grounds for visualizing an illness burden of impressive magnitude weighing upon the population (especially the poorer households) of this region.

SUMMARY

A longitudinal 78-week survey was made of study subjects in three distinct neighborhoods of Pacatuba, a town in northeastern Brazil, in an effort to learn about the frequency of febrile, respiratory, and diarrheal diseases within this population. Information was collected by a survey team member during once-weekly visits to each study household, the data obtained being based on one adult's recollection of symptoms exhibited over the preceding week by household members. In all, data from 48 families were obtained for a sufficient length of time and with sufficient regularity to be included in the subsequent analysis.

This analysis showed that febrile, respiratory, or diarrheal disease symptoms were reported in approximately one-third of all the study weeks for children

between one and two years of age in the two poor neighborhoods covered in the survey. Thereafter, in progressively older age groups, this rate declined steadily to adult levels. The average numbers of febrile, respiratory, and diarrheal disease episodes reported for children under five in the two poor neighborhoods (Matadouro and São João) were 6, 8.5, and 3.4 episodes per year in Matadouro and 4.2, 7.8, and 5.1 episodes per year in São João.

In contrast, study children in the middle-class center of Pacatuba appeared to have consistently lower morbidity in all the age groups studied. Overall, the morbidity patterns in this neighborhood tended to resemble those reported for Cleveland, Ohio, and Charlottesville, Virginia (12, 13). Whether or not underreporting could be partly responsible for these

low apparent rates is uncertain. It is likely, however, that the data from the two poor neighborhoods reflect the general morbidity patterns prevailing among the large impoverished rural populations of Northeast Brazil, a rural population of over a million inhabitants, and one in which over 90% of the children

belong to families with per capita incomes of less than US\$30 per month. The data reported thus provide tentative grounds for visualizing an illness burden of impressive magnitude borne by this much larger population.

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