

Revista de Saúde Pública  
ISSN 0034-8910 versão impressa

Rev Saúde Pública 2004; 38(1)

## Mortality among children enrolled in public day care centers in Brazil

Eneida S Ramos Vico<sup>a</sup> and Ruy Laurenti<sup>b</sup>

<sup>a</sup>Secretaria Municipal da Saúde de São Paulo. São Paulo, SP, Brasil. <sup>b</sup>Departamento de Epidemiologia da Faculdade de Saúde Pública da Universidade de São Paulo. São Paulo, SP, Brasil

---

### ABSTRACT

#### Objective

To describe the mortality pattern among children enrolled in public day care centers.

#### Methods

This was a descriptive study of the mortality pattern among children aged from 0 to 6 years and 11 months who were enrolled in all the public day care centers in the city of São Paulo, Brazil, from 1995 to 1999. The variables of interest were sex, age, underlying cause of death, duration of day care attendance and seasonality.

#### Results

The average mortality rate for the period was 36.4 per 100,000 children. Of the total number of deaths, 32.7% were among children under 1 year old and 78.4% under 3 years old. The deaths of

54.2% of these children occurred before completing six months in the day care center, with a concentration of 36.3% during the first three months. The majority of the deaths occurred during the winter and autumn seasons: 31.8% and 29.6%, respectively. The main underlying causes of death were infections: pneumonia (29.6%), meningococcal disease (13.0%), non-meningococcal meningitis (8.5%), gastroenteritis (7.6%) and chickenpox (5.4%). External causes were responsible for 13.5% of the deaths and included falls, being run over, drowning, burns and physical aggression.

## Conclusions

The study indicated that younger children (0-3 years) were the most vulnerable group and that the majority of deaths derived from avoidable causes, some of which preventable by vaccination nowadays.

## Keywords

Infant mortality. Child day care centers. Underlying cause of death. Mortality rate. Seasonal variations.

---

## INTRODUCTION

The growing availability over recent decades of attendance for children in day care centers or institutions of this type has been a source of new studies. Within the field of healthcare, such centers now give rise to a further question for public health, in relation to groups at risk. In addition to young children's natural vulnerability, those that are enrolled in day care centers have a greater probability of acquiring and developing infections, especially repeated infections of a respiratory, gastrointestinal and skin nature. The collective environment of day care centers provides the conditions for large-scale circulation and transmission of pathogenic agents.<sup>2,6,9,19</sup> In Brazil, recent research exists on child development, care given to children in day care centers and the effects of such care on their health. The information made available has in some manner contributed towards consolidating the specific attendance model as well as in the adoption of standards for procedures and more appropriate care, both in the individual and collective spheres. It has also reduced the risks and damage to health, thereby resulting in improvement in the quality of attendance.

However, the situation regarding mortality has not been analyzed, despite its importance in the context of day care centers. The present work therefore had the objective of describing the mortality pattern among children who were placed in day care centers.

## METHODS

This was a prospective descriptive study covering all the children aged zero to six years and 11 months who were enrolled in the municipal network of day care centers in the city of São Paulo, Brazil, as shown in Table 1. All the deaths among children in these day care centers that occurred during the period from 1995 to 1999 were studied.

**Table 1-** Number of day care centers in the municipal network of São Paulo and the respective number of children attended, for the period from 1995 to 1999.

| Municipal day care center network | Year    |         |         |         |         |
|-----------------------------------|---------|---------|---------|---------|---------|
|                                   | 1995    | 1996    | 1997    | 1998    | 1999    |
| No. of day care centers           | 696     | 698     | 716     | 723     | 726     |
| No. of children attended          | 114,570 | 124,003 | 123,595 | 123,243 | 127,606 |

Source: São Paulo Municipal Department of Social Assistance, 2000.

The data were obtained from the death notification records that, together with reports on the histories that led to the deaths, form the mortality information system of the day care center network administered by the Municipal Department of Social Assistance of São Paulo. This system was implemented in January 1995 and notification in this system is compulsory. It has the aim of monitoring the occurrence of deaths among those enrolled in the network, as well as the processes that led to these deaths, thereby allowing greater responsiveness in actions taken. This information was complemented with copies of the original death certificates, furnished through the mortality information improvement program (PRO-AIM) or the SEADE Foundation.

The following variables were observed: sex, age at death, seasonality, mother's education level, duration of day care attendance (from the date of enrollment until the child's last day of presence) and the underlying cause of death. These were selected and grouped in accordance with the 10<sup>th</sup> Revision of the International Statistical Classification of Diseases and Related Health Problems (ICD-10). To standardize the data analysis, the deaths that occurred in 1995, when the ICD-9 was still in force, had their underlying causes of death recoded in accordance with ICD-10, in conformity with guidance from the Brazilian Center for Disease Classification of the Department of Epidemiology of the Faculty of Public Health of USP.

The databank was constructed using the Epi Info program, version 6.04/CDC/WHO.

The descriptive analysis was based on the frequency distribution (in absolute and percentage values), averages, mortality rates per 100,000 children per day care center for the set of cause- and age-specific deaths, and average rates for the whole period. The relationship between the number of events that occurred and the total number of children attended in the day care center network for the same year was considered. For the calculation of the mortality rates, it was not possible to utilize the persons-length of observation denominator, which would be more appropriate for dynamic population studies, due to insufficiency of information.

## RESULTS

Information was obtained regarding all the deaths (223). From this total, it was observed that 15.2% were certified by the Instituto Médico Legal (the forensic medicine service) and 31.8% by the hospital services themselves where these children were attended. It became the responsibility of the death verification service to certify 53% of the cases in which the diagnosis of the causes of death was not clearly defined.

Proportionally, the greatest number of deaths occurred among children aged under one year (32.7%), while 78.4% of the total occurred among children aged under three years (Table 2).

In the distribution by sex, 57.4% of the children who died were boys. The fact that the municipal network does not have information available regarding age and sex of the children enrolled made it impossible to perform certain comparative analyses concerning the set of day care center users.

**Table 2** – Deaths, according to sex and age in years, among children enrolled in the municipal day care center network of São Paulo, for the period from 1995 to 1999.

| Sex   | Male |       | Female |       | Total |       | Accumulated frequency |  |
|-------|------|-------|--------|-------|-------|-------|-----------------------|--|
|       | N    | %     | N      | %     | N     | %     |                       |  |
| 0  —1 | 44   | 34.4  | 29     | 30.5  | 73    | 32.7  | 32.7                  |  |
| 1  —2 | 32   | 25.0  | 23     | 24.2  | 55    | 24.6  | 57.3                  |  |
| 2  —3 | 24   | 18.8  | 23     | 24.2  | 47    | 21.1  | 78.4                  |  |
| 3  —4 | 13   | 10.1  | 12     | 12.6  | 25    | 11.2  | 89.6                  |  |
| 4  —5 | 4    | 3.1   | 6      | 6.3   | 10    | 4.5   | 94.1                  |  |
| 5  —6 | 9    | 7.0   | 1      | 1.1   | 10    | 4.5   | 98.6                  |  |
| 6  —7 | 2    | 1.6   | 1      | 1.1   | 3     | 1.4   | 100.0                 |  |
| Total | 128  | 100.0 | 95     | 100.0 | 223   | 100.0 |                       |  |

|—: Indicates limit of frequency interval

Table 3 presents the mortality rates calculated for each year of the period. There is a possibility that these values indicate a decline in the rates, but the shortness of the observation period and the small number of cases do not allow such an affirmation.

**Table 3** – Deaths among children enrolled in the municipal day care center network of São Paulo, for the period from 1995 to 1999.

| Year  | Deaths |        |
|-------|--------|--------|
|       | N      | Rate*  |
| 1995  | 57     | 49.7   |
| 1996  | 42     | 33.9   |
| 1997  | 42     | 34.0   |
| 1998  | 40     | 32.4   |
| 1999  | 42     | 33.0   |
| Total | 223    | 36.4** |

\*Rate per 100,000 children enrolled in the day care centers.

\*\*Average rate for the period.

Observing the length of enrollment in the day care center, 54.2% of those who died did not reach six months of attending the centers, and 36.3% of the deaths occurred within the first 90 days. When this variable was analyzed in relation to age distribution, it was seen that 76.7% of the deaths among children under one year old occurred within the first three months. Among children aged one and two years, 54.5% and 29.8% of the deaths, respectively, were concentrated in the first six months of stay.

The greatest frequency of deaths occurred in the autumn and winter months. The causes seen most were pneumonia (31.8% and 39.4%, respectively), meningococcal infection (10.6% and 12.7%) and non-meningococcal meningitis (10.6% and 8.5%). These two seasons accounted for 74% of the deaths among children under one year old, 60% of deaths among those aged one year and 55.3% of deaths among those aged two years.

The education level data for the mothers of the children that died during the study period showed that 8.5% were illiterate, 58.3% had completed up to the end of grade school, 6.3% up to the end of high school and for 26.5% there was no data. It must be emphasized that this was a population with an income level of up to four minimum monthly wages.

#### The causes of death

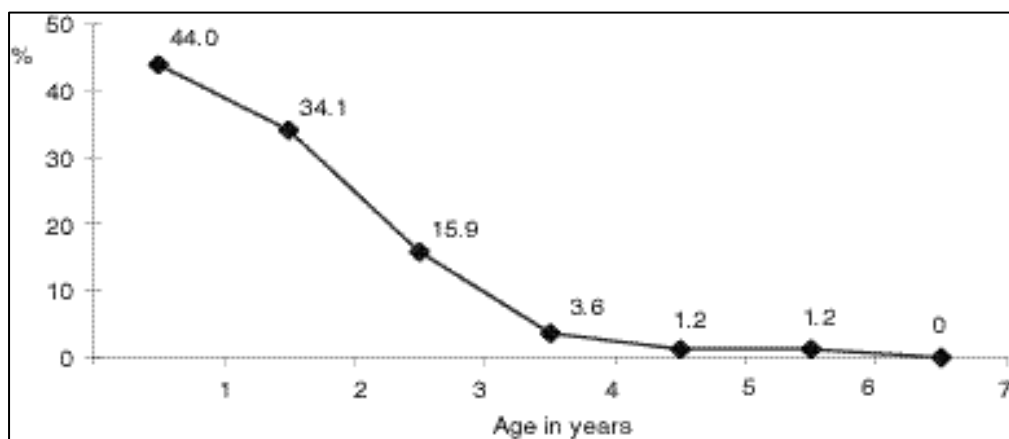
When the underlying causes were grouped according to the divisions of ICD-10 (Table 4), there were four main groups. First, in order of importance, were respiratory diseases (36.8%), which in 94.0% of the cases affected children aged under three years, with predominance of pneumonia (80.5%). Next were infectious and parasitic diseases (31.8%), of which 71.9% occurred among those aged under three years. In this group, meningococcal infections (40.8%), gastroenteritis (24.0%) and chickenpox (17.0%) were prominent. In third place were external causes (13.5%), of which falls, being run over, drowning, burns and physical aggression were the main circumstances. In fourth place were diseases of the nervous system (9.4%), basically due to meningitis, occurring exclusively among children aged under three years.

**Table 4** – Deaths, according to underlying cause of death, grouped according to the divisions of ICD-10, for children enrolled in the municipal day care center network of São Paulo, for the period from 1995 to 1999.

| <i>Underlying cause of death</i>                                    | <i>N</i>    | <i>%</i>      |
|---|-------------|---------------|
| <i>I - Infectious or parasitic diseases</i>                         | <i>71</i>   | <i>31.8</i>   |
| · <i>Diarrhea and gastroenteritis of presumed infectious origin</i> | <i>(17)</i> | <i>(7.6)</i>  |
| · <i>Tuberculosis</i>   | <i>(1)</i>  | <i>(0.4)</i>  |
| · <i>Meningococcal infection</i>                                    | <i>(29)</i> | <i>(13.0)</i> |
| · <i>Other septicemia</i>   | <i>(6)</i>  | <i>(2.7)</i>  |
| · <i>Chickenpox</i>   | <i>(12)</i> | <i>(5.4)</i>  |
| · <i>Measles</i>  | <i>(1)</i>  | <i>(0.4)</i>  |
| · <i>Viral hepatitis</i>  | <i>(4)</i>  | <i>(1.8)</i>  |
| · <i>Diseases from HIV</i>  | <i>(1)</i>  | <i>(0.4)</i>  |
| <i>II - Neoplasia</i>   | <i>2</i>    | <i>0.9</i>    |
| <i>III - Diseases of the blood and hematopoietic organs</i>         | <i>2</i>    | <i>0.9</i>    |
| <i>IV - Endocrine, nutritional and metabolic diseases</i>           | <i>5</i>    | <i>2.3</i>    |
| · <i>Malnutrition</i>   | <i>(4)</i>  | <i>(1.8)</i>  |
| · <i>Metabolic disturbances</i>                                     | <i>(1)</i>  | <i>(0.4)</i>  |
| <i>VI - Nervous system diseases</i>                                 | <i>21</i>   | <i>9.4</i>    |
| · <i>Inflammatory diseases of the central nervous system</i>        | <i>(19)</i> | <i>(8.5)</i>  |
| · <i>Other disturbances of the nervous system</i>                   | <i>(2)</i>  | <i>(0.9)</i>  |
| <i>VIII - Diseases of the ear and mastoid apophysis</i>             | <i>1</i>    | <i>0.4</i>    |
| <i>IX - Diseases of the circulatory system</i>                      | <i>4</i>    | <i>1.8</i>    |
| <i>X - Diseases of the respiratory system</i>                       | <i>82</i>   | <i>36.8</i>   |
| · <i>Bronchopneumonia/Pneumonia</i>                                 | <i>(66)</i> | <i>(29.6)</i> |
| · <i>Other acute infections of the lower airways</i>                | <i>(5)</i>  | <i>(2.2)</i>  |
| · <i>Chronic diseases of the lower airways</i>                      | <i>(4)</i>  | <i>(1.8)</i>  |
| · <i>Pulmonary diseases due to external agents</i>                  | <i>(3)</i>  | <i>(1.3)</i>  |
| · <i>Other respiratory diseases</i>                                 | <i>(4)</i>  | <i>(1.8)</i>  |
| <i>XI - Diseases of the digestive system</i>                        | <i>2</i>    | <i>0.9</i>    |

|   |            |              |
|---|------------|--------------|
| · Liver diseases  | (2)        | (0.9)        |
| XVII – Congenital malformations, deformities and chromosome anomalies | 3          | 1.3          |
| XX – External causes of morbidity and mortality                       | 30         | 13.5         |
| · Transportation accidents  | (8)        | (3.6)        |
| · Other external causes of trauma in accidents                        | (19)       | (8.5)        |
| · Physical aggression   | (3)        | (1.3)        |
| <b>Total</b>  | <b>223</b> | <b>100.0</b> |

The mortality rates for respiratory diseases, for each year investigated, were respectively 18.3, 15.3, 9.7, 10.5 and 13.3 per 100,000 children. In percentage terms these were 36.8%, 45.2%, 28.5%, 32.5% and 40.5%. The Figure shows the proportional decline in deaths over the period, observing its distribution by age.



**Figure** – Deaths due to respiratory diseases, according to age (in years), among children enrolled in the municipal day care center network of São Paulo, during the period from 1995 to 1999.

The deaths due to gastroenteritis occurred basically among children aged under one year and presented progressive year-on-year decline, such that no cases were recorded in 1999. On the other hand, attention was drawn to the deaths due to chickenpox, for which the mortality rates were on average two and a half times what is observed for the municipality of São Paulo (Table 5).

**Table 5** – Deaths due to chickenpox among children aged under seven years. Municipality of São Paulo and the municipal day care center network of São Paulo, for the period from 1996 to 1999.

| Year         | Municipality of São Paulo |                     |              | Day care center network |                     |              |
|--------------|---------------------------|---------------------|--------------|-------------------------|---------------------|--------------|
|              | Population                | Deaths <sup>a</sup> | Rate         | Population <sup>c</sup> | Deaths <sup>b</sup> | Rate         |
| 1996         | 1,118,364 <sup>d</sup>    | 11                  | 0.98         | 124,003                 | 3                   | 2.41         |
| 1997         | 1,129,502 <sup>e</sup>    | 9                   | 0.79         | 123,595                 | -                   | -            |
| 1998         | 1,141,448 <sup>e</sup>    | 7                   | 0.61         | 123,243                 | 2                   | 1.62         |
| 1999         | 1,148,500 <sup>e</sup>    | 21                  | 1.82         | 127,606                 | 7                   | 5.48         |
| <b>Total</b> | -                         | <b>48</b>           | <b>1.05*</b> | -                       | <b>12</b>           | <b>2.40*</b> |

\* Average rate for the period, per 100,000.

#### Sources:

<sup>a</sup>Mortality information improvement program (PRO-AIM/SP), 1996-1999.

<sup>b</sup>Municipal Department of Social Assistance (SAS/SGPC/Healthcare team), 1996-1999.

<sup>c</sup>Municipal Department of Social Assistance (SAS/DTDI/executive data/day care centers, 1989-1999.

<sup>d</sup>IBGE population census, 1996.

<sup>e</sup>Municipal Planning Department (SEMP/DEINFO) – estimates for 1997, 1998 and 1999.

There were four deaths recorded as due to hepatitis A. However, given its low lethality (0.05%),<sup>4</sup> this recorded cause only gave evidence of the final situation of the process of morbidity.

## DISCUSSION

In view of the fact that the day care center network does not consolidate the information on the number of children attended each month via the criterion of age, but by attendance module (lower and upper nursery, mini-group, maternal I and II, kindergarten), it was not possible to calculate mortality rates. The classification adopted by the day care network does not correspond exactly to the age groups of the present study, thereby limiting the analysis possibilities.

The main causes of death were of infectious nature and were mostly the result of causes that can be considered avoidable and capable of reduction.

The greatest number of cases was concentrated among the group aged under three years. In the municipality of São Paulo for the same period, the deaths among this same age segment of under three years (excluding children aged under 28 days) comprised an average of 86.7% (PRO-AIM).\*

\*Calculations performed on the basis of the deaths databank of the mortality information improvement program of the municipality of São Paulo (PRO-AIM).

The predominance of deaths due to pneumonia, especially among those aged under two years, and the high morbidity due to this among those enrolled in day care centers, higher than among children cared for at home,<sup>2,5,13,18</sup> demand differentiated measures for prevention, early detection and adequate treatment within the spheres of day care centers, families and the healthcare service network. It was observed that, in the municipality of São Paulo, the percentages of mortality due to respiratory diseases for the same period and age group (excluding children aged under 28 days) were proportionally lower: 35.3%, 29.9%, 28.4%, 29.0% and 25.5%, respectively (PRO-AIM).\*

The washing of hands has been indicated as one of the most important procedures for preventing the transmission of pathogens of the respiratory and gastrointestinal tracts, as well as the cleaning and disinfection procedures recommended for day care centers. Nonetheless, this simple and efficacious practice, which is considered to be a universal principle of hygiene, is one of the most difficult to achieve among employees and children, in relation to either the desirable frequency or the correct manner for doing this.<sup>2,5,11,15</sup>

The decline in deaths due to gastroenteritis that was observed year-on-year took place in parallel with a significant reduction in the risk of death due to this cause among children aged under five years that has been occurring in the municipality of São Paulo<sup>14</sup> and Brazil.<sup>8</sup> Even so, these are unacceptable rates, considering that the way to deal with such illnesses is well-known, simple and inexpensive.<sup>8</sup> Acute diarrhea is still a morbid event of high incidence in day care centers. It affects the child's nutritional state and, when the illness is recurrent,<sup>5,6</sup> it contributes towards retarding growth and development.

Hepatitis type A is a disease of low lethality. However, it presents high rates of morbidity in day care centers. According to Gaze et al<sup>10</sup> (2000), the percentages of concealed infection may reach 90.0% among children aged under five years.

The deaths due to chickenpox constituted an epidemiological finding, with a mortality rate greater than found for the municipality of São Paulo, as shown in Table 5.

There is a scarcity of Brazilian studies and information in the literature regarding morbidity and mortality due to chickenpox among children. This is a highly contagious disease and presents greater incidence among those enrolled in day care centers than in the general child population.<sup>5</sup> In situations of collective attendance (such as day care centers), the seriousness of the clinical manifestations of secondary cases is greater than those of the initial case, because of the replication of the agent, which becomes more virulent with each new infection. The quantity inoculated also increases when the length of exposure time is prolonged. For these reasons, prophylactic utilization of vaccine is recommendable.<sup>1,20</sup>

Although the accidents and physical aggression did not occur within the day care centers and were perhaps less significant in numerical terms, they deserve attention because such mortality represents just the most evident portion of a question that has a complex causal dimension.<sup>12,17</sup>

As the children's nutritional conditions improve and some infectious disease with simple prevention and treatment are controlled and reduced, the pattern of morbidity-mortality within this age group is being modified. Thus, external causes increasingly come into view. These therefore require the prevention measures that can and must exist, thereby overcoming notions of fatalism and inevitability.<sup>12,17</sup>

The findings of greater mortality within the first six months of enrollment in the day care center, especially among children aged under two years, are difficult to interpret. It was, however, observed that deaths declined as ages and lengths of stay in the day care center increased.

There are so far no other studies analyzing the picture of mortality among children enrolled in day care centers. Studies on morbidity, on the other hand, mention the benefit provided by the growing qualitative and quantitative acquisition of natural and post-vaccine immunity against main pathogenic agents that affect children in their first years of life.<sup>20</sup> Collet et al<sup>6</sup> (1994) observed after making age adjustments that children gained greater protection against repeated respiratory and gastrointestinal infections after six months of enrollment in the day care center.

The child's immaturity of immune response at this phase of its life and its dependence on care given by outsiders, among other factors, make it more susceptible to illnesses of any type.<sup>15</sup>

Several studies have demonstrated that attending day care centers is a risk factor for increased exposure and transmission of agents that cause worsening of health.<sup>2,3,9,13</sup>



Certain inherent aspects of attendance of this nature are considered to be fundamental etiological factors, such as:

- the fact that the environment brings people together in a situation of prolonged living together (10 to 12 hours);
- the great adult-child and child-child physical contact that is developed through the various care and educational activities;
- the occurrence of outbreaks of infection that are potentially more severe, favored by the large circulation of pathogenic microorganisms, especially some enteric and respiratory ones that are rapidly transmitted between employees and children, thus reaching their families and the communities they live in.<sup>5,16</sup>

This information points towards the need to redirect procedures and attitudes relating to the adaptation period for children (and their families) at the day care center, from an understanding of the greatest risks to health.

It would be opportune to establish gradational attention, with emphasis on the initial six months, in which all the aspects related to the child's growth and development would be observed. This would encompass its affective, social and nutritional needs, with emphasis on its weight, the presence of anemia, history of infections, especially repeated infections, susceptibility, family habits, the healthcare support network, and other aspects.

In view of the characterization of this group as one that is at risk, one of the possible intervention strategies for reducing the morbidity-mortality rates of day care centers would be the complementary immunization of these children and susceptible employees, using vaccines such as influenza, hepatitis A, chickenpox and others.

Another factor identified was the low educational level among the mothers, which is considered to be an important factor in the context of infancy. The better this level, the greater the possibilities are for dispensing adequate care and stimulation, and for preventing and treating diseases, thereby contributing towards reducing morbidity and mortality among the children.<sup>18</sup>

Another important question, which was analyzed by Drumond Jr. & Barros<sup>7</sup> (1999), is the social-spatial inequalities within the city of São Paulo and the consequences of socially differentiated healthcare assistance in determining individual survival. These authors considered that some causes of death might be directly related to the low quality of the routine and/or emergency services, the impossibility of performing complementary tests and the most appropriate therapy, or the lack of access to such services.

All these data suggest that further epidemiological studies in relation to morbidity in day care centers should be performed. When added to the mortality information, these could contribute towards improving public policies in this sector, under the focus of individual and collective care and attention, without detracting from their main attribute: that of promoting child education.

---

## REFERENCES

1. Baldacci ER, Vico ESR. Mortalidade por varicela em crianças atendidas em creche. *Pediatrics* (São Paulo) 2001;23:213-6.
2. Barros AJ, Ross DA, Fonseca WV, Williams LA, Moreira-Filho DC. Preventing acute respiratory infections and diarrhoea in child care centres. *Acta Paediatr* 1999;88:1113-8.
3. Berg AT, Shapiro ED, Capobianco LA. Group day care and the risk of serious infections illnesses. *Am J Epidemiol* 1991;133:154-63.
4. [CDC] Centers for Disease Control and Prevention. Viral hepatitis. [on line] 2000. Available from <<http://www.cdc.gov/ncidod/diseases/hepatitis>> [2000 sep 20]
5. Churchill RB, Pickering LK. Infection control challenges in child-care centers. *Infect Dis Clin North Am* 1997;11:347-65.
6. Collet JP, Burtin P, Kramer MS, Floret D, Bossard N, Ducruet T. Type of day-care setting and risk of repeated infections. *Pediatrics* 1994;6 Suppl 2:997-9.
7. Drumond Jr M, Barros MBA. Desigualdades socioespaciais na mortalidade do adulto no Município de São Paulo. *Rev Bras Epidemiol* 1999;2:34-49.
8. Drumond Jr M, Lira MMTA. Mortalidade precoce no Brasil. Coeficientes de mortalidade por sexo e faixa etária em 1980 e 1997. Brasília (DF): Ministério da Saúde/Fundação Nacional de Saúde; 2000. (Estudos Epidemiológicos).
9. Fuchs SC, Maynard RC, Costa LF, Cardozo A, Schierholt R. Duration of day-care attendance and acute respiratory infection. *Cad Saúde Pública* 1996;12:291-6.
10. Gaze R, Carvalho DM, Luiz RR, Servino VRR, Berro OJ, Bravim Y. Laboratórios sentinelas – uma proposta para o monitoramento das infecções pelos vírus das hepatites A e B. *Inf Epidemiol SUS* 2000;9(1):5-21.
11. Maranhão DG. O processo saúde-doença e os cuidados com a saúde na perspectiva dos educadores infantis. *Cad Saúde Pública* 2000;16:1143-8.
12. Mello Jorge MHP, Laurenti R. Acidentes e violências no Brasil – apresentação. *Rev Saúde Pública* 1997;31 Supl 4:1-4.
13. Nafstad P, Hagen JA, Oie L, Magnus P, Jaakkola JJK. Day care centers and respiratory health. *Pediatrics* 1999;103:753-8.
14. Prefeitura do Município de São Paulo. Programa de Aprimoramento de Informações de Mortalidade. PRO-AIM. Mortalidade na cidade de São Paulo no ano de 1999. *Bol Pro-AIM* 1999;(38).
15. Puffer RR, Serrano CV. Características de la mortalidad en la niñez. Informe de la investigación interamericana de mortalidad en la niñez. Washington (DC): OPAS; 1973. ( Publicación Científica, 262).

16. Régnier F, Floret D. Mesures préventives d'hygiène dans les crèches. *Arch Pédiatr* 1999; 6 Suppl 3:636-8.
  17. Souza ER, Minayo MCS. O impacto da violência social na saúde pública do Brasil: década de 80. In: Minayo MCS, organizadora. Os muitos brasis: saúde e população na década de 80. São Paulo: Hucitec; 1995. p. 87-116.
  18. Victora CG, Barros FC, Vaughan JP. Epidemiologia da desigualdade. 2ªed. São Paulo: HUCITEC; 1989.
  19. Victora CG, Fuchs SC, Flores JA, Fonseca W, Kirkwood B. Risk factors for pneumonia among brazilian children: a hierarchical analysis. *Pediatrics* 1994;93:977-85.
  20. Vigneron P, Bégué P. Quel est l'âge d'acquisition de l'immunité contre les principaux agents pathogènes dans les premières années de vie? Y a-t-il un âge idéal pour entrer en collectivité? *Arch Pédiatr* 1999;6 Suppl 3:602-10.
- 

### Address to correspondence

Eneida Sanches Ramos Vico  
R. Gal. Calado, 301/52 Tatuapé  
03334-060 São Paulo, SP, Brasil  
E-mail: eneidavico@uol.com.br

Based on master's degree dissertation presented to the Faculdade de Saúde Pública of the Universidade de São Paulo, 2001.

Received on 10/12/2002. Reviewed on 30/6/2003. Approved on 21/7/2003.

---

© 2003 Faculdade de Saúde Pública da Universidade de São Paulo

Avenida Dr. Arnaldo, 715  
01246-904 São Paulo SP Brazil  
Tel./Fax: +55 11 3068-0539

[revsp@org.usp.br](mailto:revsp@org.usp.br)

