

Mortality in first infancy in the City of Buenos Aires in the 1860-2002 period

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Resumen

Aquí se analiza la tendencia de la mortalidad infantil en la Ciudad de Buenos Aires, utilizando como información básica los datos suministrados por los registros de nacimientos y defunciones ocurridos y registrados en la ciudad a lo largo del periodo 1860-2002. Se investigan las causas de muerte por grupos de edad, toda vez que el estudio de la mortalidad por causas es un paso necesario hacia la explicación de los niveles de mortalidad en términos de factores económicos, sociales y culturales.

Palabras clave: mortalidad infantil, tasa de mortalidad, causa de muerte, Ciudad de Buenos Aires.

Abstract

Mortality in first infancy in the City of Buenos Aires in the 1860-2002 period

The tendency of the infantile mortality in the City of Buenos Aires is hereby analyzed, using as basic information data provided by the births and deceases occurred along the 1860-2002 period. The causes of death are researched by age groups, since the study of mortality by cause is a necessary step towards the explanation of the levels of mortality in terms of economic, social and cultural factors.

Key words: infantile mortality, mortality rate, cause of death, City of Buenos Aires.

In all of the civilized human gathering's casualties there is a group whose study is the object of the greatest interest from the hygienist, the government man and the philanthropist, for the universal experience proves that, when it exceeds certain proportions, it is because there are destructive causes that can be lessened. I hereby refer to infantile casualties
(Martínez, 1913: XXIV).

From the acknowledgement of the importance historically infantile mortality has had as an indicator of the sanitary and socio-cultural conditions of a society and understanding that it cannot be analyzed in abstract, as it is inserted into the development of history and social organizations, this work's purpose is to distinguish the factors which determined the level of mortality in first infancy and explain the historic tendency Buenos Aires had in the 1860-2002 period by means of the analysis of its magnitude and structure.

In order to measure mortality in first infancy mortality rate was used, defined as the relation between deceases of children under five years of age in a given year and those born alive the same year.¹ This indicator was selected bearing in mind the availability of data from the vital statistics in the period.

So as to discover the general tendency followed by mortality in first infancy, from the mid XIX century it was considered convenient, from the methodological point of view, to analyze the rates' quinquennial averages in order to avoid the incidence of notorious annual fluctuations, specially in the beginnings of the period, essentially derived from the numerous epidemics witnessed in the city.

Evolution

The notorious descent in infantile mortality was one of the most important and extensive social changes in the last century and a half. The mechanisms of this transformation constitute the center of a debate that long ago captivated the interest of diverse specialists. Demographers, economists, epidemiologists, historians, politicians and sociologists are still discussing on the role, magnitude and interaction of the different explanatory factors that operated in the descent of mortality: the demographic growth public health progresses, personal hygiene, ecologic changes, the conditions of life and labor and the measures of social protection.

During the 1960's decade, the explanation of secular descent stressed improvement in public hygiene and diseases' control, a moment when the State had assumed the organizing role of public defense against ailments and providing basic health services (Schofield and Reher, 1991). By the mid 1970's, the already classic and controversial thesis by McKeown took the battle to another field. Starting from the knowledge that mortality reduction in developed countries in the XIX century was due to infectious diseases' reduction, McKeown diminishes credit to the sanitary measures and medical advances, focusing it instead on economic and social changes. The author mainly emphasizes that economic growth and the improvement in life levels contributed to increment population's nourishment, which enabled it to better resist infections (McKeown, 1976).

¹ In the analysis the age groups of the first infancy are discarded: infantile mortality (neonatal and post-neonatal) and of children from 1 to 4 years of age.

McKeown's thesis is still a reference point in debate, although part of the hypotheses were doubted by some other researchers (Wrigley and Schofield, 1981; Preston, 1988; Szreter, 2002, and Colgrove, 2002). Nevertheless, nowadays there seems to be consensus among the researchers, as for accepting as valid the idea that medical science in its healing role had a lesser role in mortality's descent in the early XX century (Colgrove, 2002), as well as the life level and economic issues are crucial for the population's health (Wilkinson, 1992; Evans, 1996; Marmor, 1996, and Szreter, 2002). Later discussion achieved consensus respect to consider as explanatory factors both the initiatives of the sanitary reform as improvements in life level and their impact on nourishment as key in mortality's descent.

In Buenos Aires, first infancy's mortality level, as seen in graph 1, descended as from the 1870-1874 quinquennium. The rate has its peak level in the 1865-1869 quinquennium (404.7 per thousand), and the minimum (10.6 per thousand) in the 2000-2002 period (table 1).

It is convenient to remember that Buenos Aires was affected by numerous epidemics, especially between 1869 and 1900, being this period when casualties caused by infectious diseases were more abundant, which partially explained the high level of mortality and the fluctuations in the phenomenon's tendency.

With the intention to look for the explanatory factors that influenced on the pace followed by mother-infant mortality an index was elaborated taking as base the 1860-1864 quinquennium, which allowed identifying very different stages in the process. Through this index it was possible to verify that in the last quarter of the XIX century there is a stressed acceleration of the descent pace of first infancy mortality, being reduced to a half in the 1900-1904 quinquennium.²

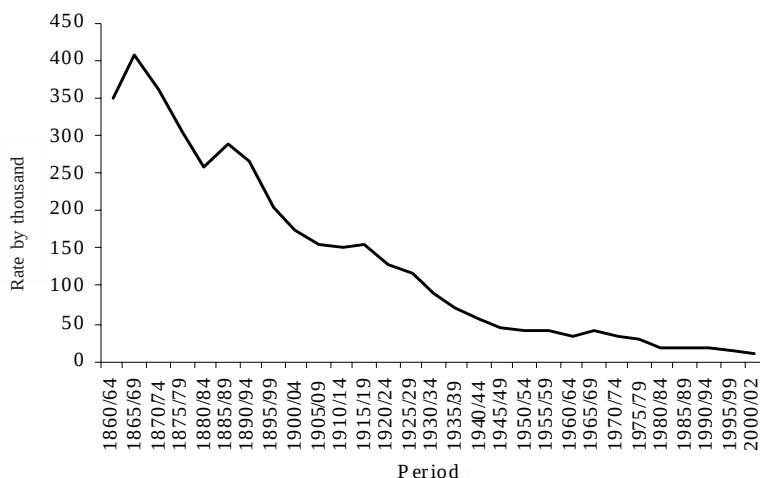
This period coincides with a greater preoccupation of the sanitary authorities in decreeing measures referred not only to public hygiene but also to the protection of first infancy.

Later, in the first half of the XX century, a new stage was developed where the reduction of mortality of the first infancy was very clear. Comparing the quinquenniums 1985-1899 and 1945-1949 there is a diminution of 78 percent.³ The improvement in the population's quality of life as from the broadening of the environment's sanitary services (providence of palatable water, sewerage system, waste removal), protection to first infancy and the increment of the real salary would have influenced mortality descent. In this period, as it will be seen

² This reduction was 1.2 percent annual.

³ Reduction of 1.6 percent annual.

GRAPH1
FIRST INFANCY MORTALITY (RATES BY THOUSAND BIRTHS).
CITY OF BUENOS AIRES, 1860-2002



Source: table 1.

further in this text, the reduction of casualties caused by lack of hygiene or malnutrition is notorious (Mazzeo, 1993).

In the 1950-1979 period there is a stage where reduction was not so stressed, with a descent of 36 percent, a fact that indubitably has to do with the levels mortality rate in first infancy assumes, which in previous decades were quite inferior to those of the beginning of the century, being the average annual reduction 1.2 percent. Separately, one of its components, infantile mortality, was practically steady and it even increased in the 1965-1969 quinquennium (34.6 per thousand), as the increment of mortality caused by the increment of infectious and parasitic diseases, and diarrhea. Finally, this rate's level was reduced to a third during the period that starts in 1980, being registered a yearly average reduction of 2.8 percent. This stage is influenced by the sustained reduction of infantile mortality, especially that neonatal, which decreases 66 percent.

TABLE 1
FIRST INFANCY MORTALITY (RATES BY THOUSAND BIRTHS).
CITY OF BUENOS AIRES, 1860-2002

Period	Rate	Period	Rate
1860/64	350.1	1930/34	91.7
1865/69	404.7	1935/39	71.2
1870/74	362.5	1940/44	55.2
1875/79	305.2	1945/49	45.3
1880/84	256.9	1950/54	41.5
1885/89	286.4	1955/59	39.8
1890/94	263.1	1960/64	35.5
1895/99	206.0	1965/69	39.2
1900/04	172.3	1970/74	34.7
1905/09	154.1	1975/79	29.0
1910/14	151.2	1980/84	20.6
1915/19	152.9	1985/89	18.6
1920/24	129.1	1990/94	16.8
1925/29	118.4	1995/99	14.4
		2000/02	10.6

Source: own elaboration based on vital statistics.

Structure by age in mortality's determination

With the intention to be able explain the tendency followed by first infancy mortality it was necessary to examine its condition by age. First infancy's mortality was divided into two differenced age groups: mortality in the first year of life (also called infantile mortality) and that which occurs between the first year of age and the fourth. At the time, infantile mortality comprehends two stages: the neonatal that takes place during the first four weeks, and the postnatal, which occurs during the first year of life. Infantile mortality according to etiology, is disaggregated in exogenous mortality (infectious diseases, malnutrition or inadequate feeding and accidents) and endogenous mortality (immaturity in the born child, malformation, congenital weakness and birth traumatisms). Before approaching the analysis of the components of infantile mortality it is convenient to remind the relation between the age of the deceased child and the decease's

etiology, since most of the deaths by exogenous causes are produced in the neonatal period and almost all of the post-neonatal casualties are caused by exogenous causes. This is explained in relation to the nature of the causes of death, whose large part, after the first month of life are related to the environment where the child grows and whose control was achieved through the advancement of health and medicine. Conversely, a considerable part of the causes of death in the first month of life have an endogenous origin and are caused by congenital factors during intrauterine life and other associated to birth; upon them the progresses were slower and their reduction required greater efforts.

When the evolution of first infancy's morality is analyzed distinguishing the age groups that compose it, as it can be seen in the values in table 2, there are three clear periods.

The first one takes up from the mid XIX century to the early XX (1860-1904). In the same period there was an important descent in neonatal mortality: the rate that was 153.8 per thousand in the 1860-1864 period is reduced to a sixth part in the 1900-1904 quinquennium (24.1 per thousand). Probably in this reduction has influenced the fact that as from the 1880's decade the hospitals, which were isolation centers, became truly assistance centers, increasing their capacities and making their equipment more sophisticated (Mazzeo, 1993).

Post-neonatal mortality during this period was characterized by having oscillations in its level, with extremes reaching 146.2 per thousand and 72.5 per thousand, however, with a clearly descending tendency from the 1885-1889 quinquennium, when the rate decreased 44 percent.

The second period developed between 1905 and 1969 and here mortality was reduced to 64 percent, nonetheless it presented a differential behavior according to the age group. Neonatal mortality level is present as an almost parallel line to the horizontal (graph 2). The reduction of neonatal mortality in this period was 11 percent due to an important increment in the 1965-1969 quinquennium, caused by the increment of morality by peri-natal or first age causes.

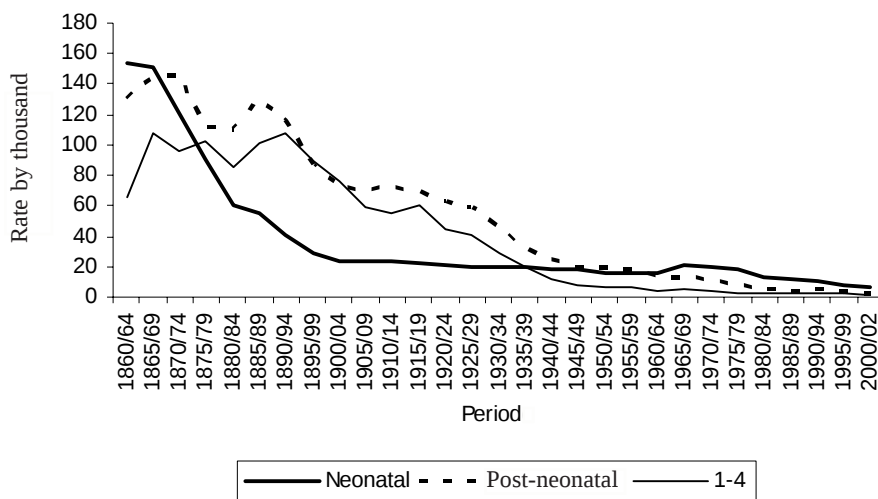
Post-neonatal mortality registers a growing tendency, with a slower pace up to the 1925-1929 period (it was reduced 19 percent) and more accelerated from 1930, during the period 1930-1969, post-neonatal mortality rate decreased 78 percent. As from the 1930's decade the exogenous causes (infectious and parasitic) registered a sustained reduction, which as it will be pinpointed, influence postnatal mortality.

TABLE 2
FIRST INFANCY MORTALITY RATE AND ITS COMPONENTS.
RATES BY THOUSAND BIRTHS. CITY OF BUENOS AIRES, 1860-2002

Period	Neonatal	Post-neonatal	Under one year	1 to 4 yrs	0 to 4 yrs
1860/64	153.8	130.1	283.9	66.2	350.1
1865/69	151.6	144.8	296.4	108.3	404.7
1870/74	120.6	146.2	266.8	95.7	362.5
1875/79	90.5	111.9	202.4	102.8	305.2
1880/84	60.1	110.9	171.0	85.9	256.9
1885/89	55.4	129.5	185.0	101.4	286.4
1890/94	40.4	115.4	155.7	107.4	263.1
1895/99	29.4	87.3	116.7	89.3	206.0
1900/04	24.1	72.5	96.7	75.7	172.3
1905/09	23.6	70.8	94.5	59.6	154.1
1910/14	23.3	72.9	96.2	55.0	151.2
1915/19	22.0	69.9	91.9	61.0	152.9
1920/24	21.6	62.6	84.2	44.9	129.1
1925/29	19.1	58.7	77.8	40.5	118.4
1930/34	19.1	44.1	63.1	28.6	91.7
1935/39	19.5	32.0	51.5	19.7	71.2
1940/44	19.0	24.9	43.9	11.3	55.2
1945/49	17.9	20.0	37.9	7.5	45.3
1950/54	15.3	19.5	34.7	6.7	41.5
1955/59	15.2	18.5	33.7	6.1	39.8
1960/64	16.3	14.8	31.1	4.4	35.5
1965/69	21.4	13.2	34.6	4.6	39.2
1970/74	19.6	11.4	31.1	3.6	34.7
1975/79	17.8	8.1	25.8	3.2	29.0
1980/84	13.3	5.0	18.3	2.3	20.6
1985/89	11.5	4.3	15.8	2.8	18.6
1990/94	9.9	4.8	14.7	2.1	16.8
1995/99	8.4	4.0	12.3	2.0	14.4
2000/02	6.1	3.2	9.3	1.3	10.6

Source: own elaboration based on vital statistics.

GRAPH2
FIRST INFANCY MORTALITY ACCORDING TO AGE GROUP
(RATES BY THOUSAND BIRTHS). CITY OF BUENOS AIRES, 1860-2002



Source: table 2.

As from 1970 there is a continuous decrease in neonatal mortality level, it was reduced 71 percent. Post-neonatal mortality rate registers the most important decrease in the period of study being reduced 76 percent: from 13.2 per thousand in the 1965-1969 quinquennium it descends to 3.2 per thousand in the 2000-2002 triennium. These important diminutions are related to the establishment, in 1968, of the Service of Neonatology and the application, starting in 1973, of a program destined to protect mother and child's health by means of alimentary assistance, health's control, immunizations, permanent medical attention and recovery of the undernourished child.

Mortality from 1 to 4 years of age, during the first three aforementioned periods, has a similar behavior, yet with lower levels than the post-neonatal one. In the first period it is influenced by epidemics experienced in the city, the rate fluctuates between 1860 and 1894 and decreases as from 1895. In the second period it was reduced 94 percent; finally, its behavior becomes stable as from 1970.

By means of the analysis of the structure by age of infantile mortality in Buenos Aires it can be proved that to a higher rate's level⁴ corresponds a greater participation of post-neonatal mortality and that, in an inverse way, decreasing the rate's level neonatal mortality acquires relative importance.

Neonatal mortality had a major contribution between 1870 and 1959, especially between the years 1890 and 1892, where it recorded participations above 75 percent. As from the 1960-1964 quinquennium, neonatal mortality started to acquire importance, increasing its participation between the years 1960 and 2002, period when infantile mortality was reduced 72 percent.

What we have exposed allows corroborating the hypothesis that the lesser infantile mortality level the lesser participation of post-neonatal levels.

In respect to mortality from one to four years of age, as seen in graph 4, there is a similar behavior to that of the post-neonatal, however, with lesser participation.

Another way to analyze the evolution of mortality is performed by means of the table of mortality, considered as the most complete tool for the analysis of a population's mortality, as it nullifies the effect of the structure by ages of it.

In order to describe the course of total mortality life expectancy at birth can be used, which summarizes the occurrences along the ages; nevertheless it has great influence from infantile mortality. For the case of mortality of first infancy one draws to life expectancy at four years of age, which analyzes the incidence of mortality before being five years old.

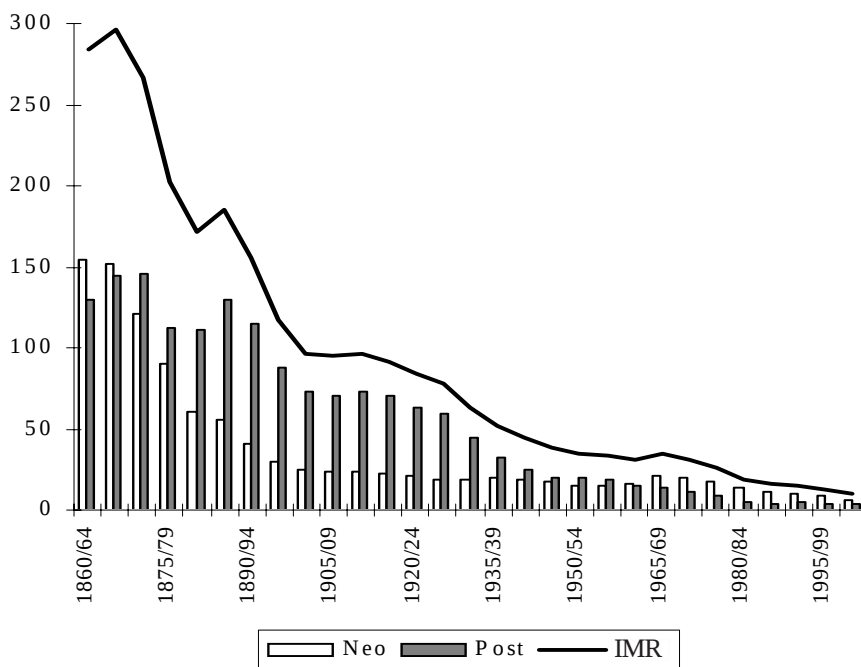
The increment of life expectancy was not constant along the considered period (table 3), even there were three increments in mortality, one between 1855 and 1869⁵ and two of lesser importance: between 1904 and 1909, and between 1960 and 1970.

In relation to the first diminution, it is important to distinguish that in this period there were several epidemics, especially cholera and dysentery, as well as a large number of deaths caused by typhoid fever. Moreover, it is necessary to take into account that the first tables of mortality were constructed from very poor basic information. Distribution by age at death was used corresponding to 1856 and it was applied to the corpses buried in the cemeteries in the city during 1855. This makes us be cautious when taking the increment of the mortality level in the tables corresponding to the years 1855 and 1869.

⁴ Except in the 1860-1869 period, probably because of deficiencies in the registration or causes related to sepsis in birth.

⁵ Where life expectancy at birth decreased approximately six years.

GRAPH3
INFANTILE MORTALITY RATE, ACCORDING TO AGE GROUPS.
CITY OF BUENOS AIRES, 1860-2002

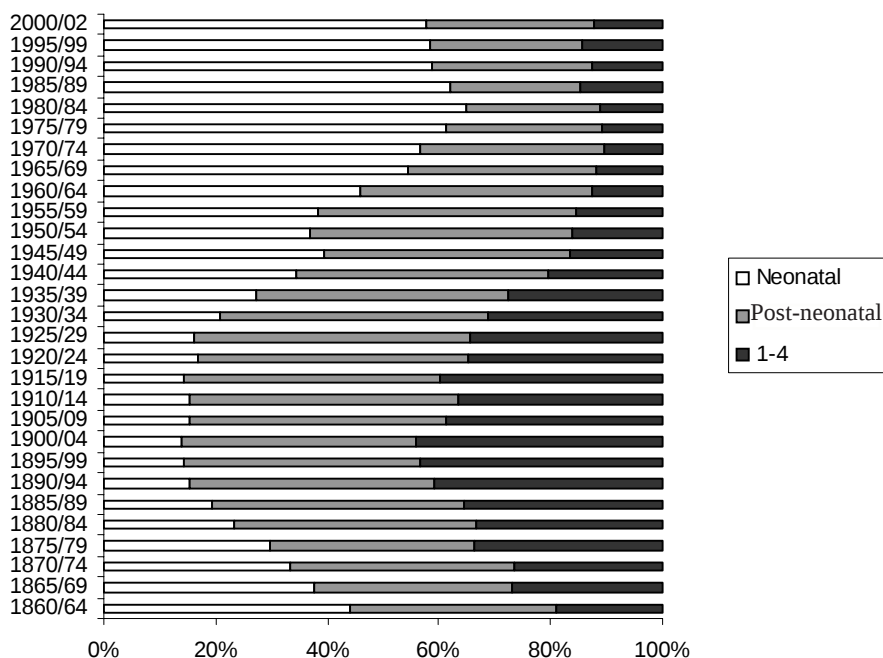


Source: table 2.

In respect to the other two diminutions, their interpretation is more complex. In the first case it could not be feasibly determined if it was the real expression of an increment in mortality, even if it is notorious the increment between 1906 and 1908 of the casualties by infectious and contagious diseases, especially caused by typhoid fever, smallpox, measles, diphtheria, and crup. Between 1960 and 1970 it would seem to be the reflection of the real increment of mortality, or at least a stagnation of its descent.

Separately, the pace of growth the values of life expectancy at birth and at four years of age was not constant in time, in addition to be rather different between them. This fact demonstrates the incidence that took place by the end of the XIX century and the beginning of the XX in the estimation of life expectancy at birth and also indicates that after certain threshold—around the first year of life—the population's survival probability was greater.

GRAPH4
STRUCTURE BY AGE OF THE FIRST INFANCY.
CITY OF BUENOS AIRES, 1860-2002



Source: table 2.

Demographic transition and epidemiologic transition⁶

Industrial revolution and the social and cultural transformations which accompanied it radically modified the conditions of the population's growth. Progress in medicine and hygiene, nevertheless also economic development and improvement in nutrition caused an intense and durable mortality's decrease, while the generalization in the familial life sphere of the elective action, by means of the reduction and planning of births, caused the same in fertility (Vallin, 1991). According to the theoretical model of 'demographic transition', traditional society was characterized by the so-called 'high demographic potentiality', this is to say, high natality and mortality; there was then a transition phase where

⁶ It is the transition in the population's causes of death, changing from infectious and acute diseases as main cause to chronic and degenerative diseases.

TABLE 3
LIFE EXPECTANCY AT 0 AND 4 YEARS OF AGE. BOTH GENDERS.
CITY OF BUENOS AIRES, 1855-2002

Period	e(0)	e(4)	Interval range	Increment by year		Gain between periods	
				e(0)	e(4)	e(0)	e(4)
1855	32.27	39.77					
			14	-0.42	0.07	-5.87	0.92
1868-1870	26.40	40.69					
			18	0.29	-0.02	5.28	-0.29
1887	31.68	40.40					
			8	1.15	1.01	9.20	8.11
1894-1896	40.88	48.51					
			9	0.76	0.48	6.80	4.32
1903-1905	47.68	52.83					
			5	-0.15	-0.10	-0.77	-0.51
1908-1910	46.91	52.32					
			5	0.34	0.24	1.72	1.18
1913-1915	48.63	53.50					
			22	0.49	0.37	10.81	8.04
1935-1937	59.44	61.54					
			11	0.53	0.41	5.80	4.47
1947	65.24	66.01					
			13	0.42	0.39	5.50	5.05
1959-1961	70.74	71.06					
			10	-0.16	-0.29	-1.56	-2.89
1969-1971	69.18	68.17					
			11	0.28	0.14	3.05	1.52
1980-1981	72.23	69.69					
			10	0.05	0.04	0.49	0.40
1990-1992	72.72	70.09					
			10				
2001-2002	75.91	75.80		0.32	0.57	3.19	5.71

Source: own elaboration, based on Müller (1974) and INDEC (1975-1988-1995-2004).

firstly, mortality decreased and then with variable delay in the country, natality started to decrease; eventually, it started to become steady whereas mortality decreased even though at a slower pace. This last phase was called of 'low demographic potentiality'.

In accordance with this model, Buenos Aires is located in its pre-transitional phase in the period from the mid 1880's decade until its end. It is characterized by a decreasing tendency and then increasing of the gross birthrate between 1860 and 1880 (graph 5), with oscillations in gross casualty rate, heavily influenced by the numerous epidemics witnessed in this period.⁷ By then the city had a high potential of future growth.⁸

From 1890, the balance between births and casualties was amply positive. Mortality descended before and more rapidly than natality, which made it the period with the greatest vegetative growth of the city.⁹ This high 'current' growth is the reflection of the beginning of the 'transitional' process developed until the start of the 1960's decade, moment from which the vegetative growth of the population starts having a decreasing tendency. The potential of the population's future growth is low, because the possibilities of a reversion in the tendencies in birthrates and death rates are scarce. It can be stated that the third stage, once the transition was completed, started in the 1960's decade (Mazzeo, 2003).

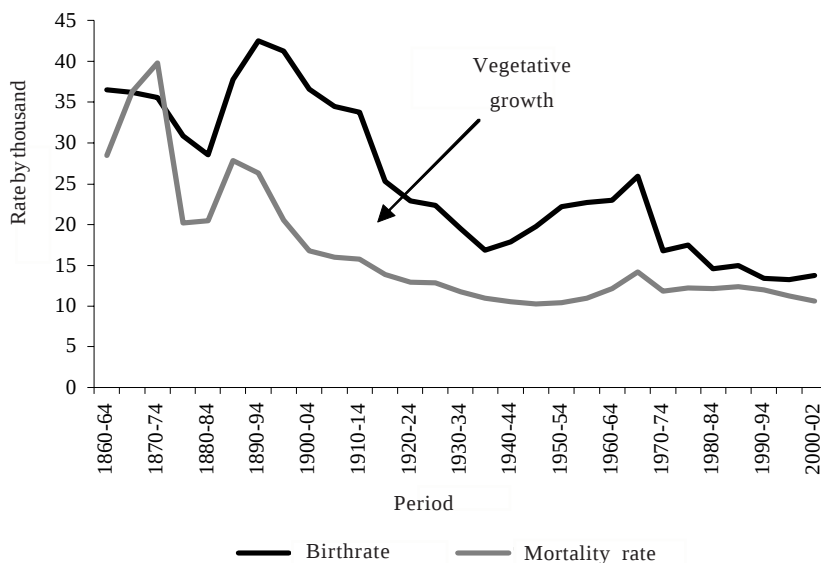
The sustained descent in mortality is undoubtedly related to the evolution of the history of the structure by causes of death. At the beginning of the 1970's decade, Omran introduces the concept of epidemiologic transition in order to characterize the evolution of the structure by causes of mortality in the world. For Omran, the main motor of epidemiologic transition was the descent of infectious mortality, changing from the epoch of 'the epidemics and hunger' to that of 'the degenerative diseases and those of society'. According to Meslé (1995), were important in the world the gains due to the decrease of infectious and respiratory mortality, mainly in the first decades of the XX century and particularly in the 1950's decade, thanks to the diffusion of treatments with antibiotics. Hence, from the 1960's the reduction of these causes contributed

⁷ Casualties registered in the city by epidemics during the 1858-1869 period: 3975; between 1871 and 1890: 33389 (by yellow fever in 1871, 13164 deaths) and, finally, between 1891 and 1915: 8623.

⁸ According to the 1887 Census, the city's population was below half a million people and the annual average of births in the 1880-1894 quinquennium was ten thousand births.

⁹ Changes in this process cannot be understood without including the analysis of overseas immigration; its intensity and volume was such that it can be related to a substantial renovation of the city's population. Immigrants represented in 1895, 52 percent of the population; later, its participation is reduced until it reaches 23 percent, in 1960. This immigration had its effects in the city's marriage and natality by the end of the XIX century and the early XX.

GRAPH5
DEMOGRAPHIC TRANSITION PROCESS IN THE CITY OF BUENOS AIRES.
PERIOD 1860-2002



Source: Mazzeo, 2003.

favorably to the increment of life expectancy at birth. Separately, it is observed that the diminution of mortality by infectious causes was particularly important among children. The determinants of this descent are multiple and in the XIX century nutritional progress are indubitably concluding. Their effect was reinforced by the improvement in hygiene of the environment and, in general, of the conditions of life, especially towards the end of the XIX century. After the World War II, the discovery of antibiotics and the generalization of vaccinations accelerated the process.

Hence, for a better understanding of the process of epidemiologic transition in infantile mortality, it was considered as indispensable to perform the analysis of the evolution of mortality by causes.

Selection of the main mortality causes

In order to observe the process of epidemiologic transition five groups of causes were considered, three of which have exogenous origin, and the other two, endogenous origin. The diseases which were included in each of the groups are specified in the following table.

Mortality tendency by cause of death

There are evidences of a relation between the level of infantile mortality and the different causes of death, particularly those called endogenous and exogenous (Behm, 1985). It was observed that when mortality is high the exogenous causes register a greater participation and when they decrease mortality also does, which allows stating that mortality's descent was mainly due to the reduction of deaths of exogenous origin.

This responded to the control of the environmental factors and also to the massive immunization of the population and the use of new drugs. Thus, the structure of mortality by cause of death is modified and the rest of the groups become more relevant, among them those with endogenous origin, it is, congenital malformations and those originated in the peri-natal period (Behm, 1985).

These evidences were proved for Buenos Aires when analyzing the behavior of mortality according to causes of death and age group.

Infectious and parasitic

Between the end of the XIX century and the early XX there was an accelerated process of urbanization in the City of Buenos Aires, characterized by a large concentration of population and scarce sanitary infrastructure, which provoked imbalance between urban infrastructure and population, thus deteriorating the population's epidemiologic conditions. This 'urban penalization' (Reher, 1995) would have provoked an increment in mortality, therefore infectious and contagious diseases were part of the city from an early age. Altogether with the existing epidemics there were also endemic diseases such as typhoid fever, smallpox, diphtheria and crup, which were also deadly. Medics of the epoch, even if emphasized atmospheric factors, centered their discourse on hygiene

TABLE 4
CLASSIFICATION OF THE CAUSES OF DEATH
ACCORDING TO GROUP AND ORIGIN

Exogenous origin ^a	Endogenous origin
I Infectious and parasitic: Infantile cholera, coqueluche, crup, diphtheria, scarlet fever, typhus fever, influenza, smallpox, erysipelas, tetanus, tuberculosis and measles.	IV Congenital malformations: Hydrocephaly, bifid spine, hearth organic vice, and other congenital malformations.
II Diarrhea and enteritis	V First age (peri-natal), pregnancy complications, birth labor, disorders related to short gestation length and slow fetal growth, etc.
III Respiratory: pneumonia, other respiratory diseases.	

^a It is necessary to bear in mind that the existing interaction between exogenous diseases. Weakness generated in the children by diarrhea exposed them to acquire infectious-contagious or respiratory diseases.

Source: own elaboration based on vital statistics.

conditions and contagion; this was added to poor etiologic knowledge of the diseases and the diseased people resistance to isolation as they preferred to stay at their households. By the end of the 1880's decade "95 percent of the inhabitants with infectious-contagious diseases was assisted at their households, however, their assistance was not always granted" (Álvarez, 2004: 20).

Infectious-contagious diseases were seen as ailments caused by urbanization, product of the stacking and lack of environmental cleanliness. The plan of health destined to provide an integral solution to the problem (as source, treatment and distribution network) of potable water supply was started in 1871; some years later, in 1880, the sewerage works began. In the early XX century, 61.4 percent of the household had piped water and only 36.2 percent sewerage system, nevertheless "the uneven distribution of this service in the city caused some diseases, such typhus fever, were endemically localized, hence in the suburbs of the city typhus fever endemically ruled" (Álvarez, 2004: 30). Between 1914 and 1924, the city was considered, according to the expression by Besio Moreno, a "sanitized city"; circa 1930 the infrastructure and equipping of the city were concluded (Mazzeo, 1993).

Another of the sanitary measures taken was vaccination. Vaccination against smallpox and typhus managed to control, by the end of the first decade of the XX, mortality caused by smallpox and typhus fever. The Congress of the Nation decreed a law on compulsory vaccination and re-vaccination in 1903.

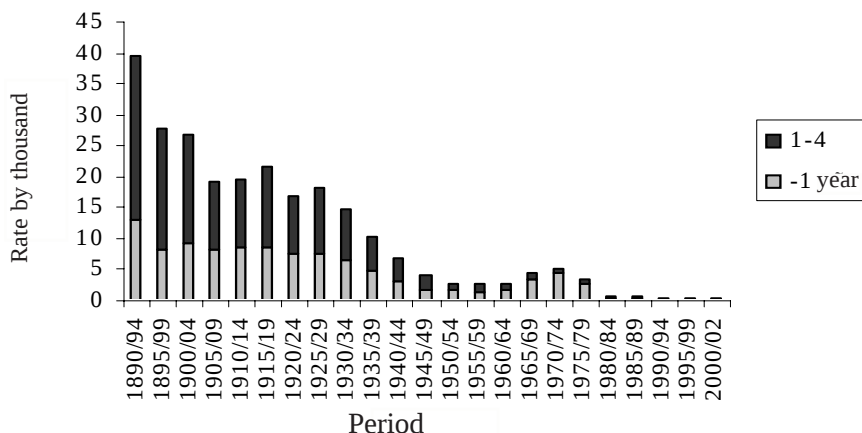
Ever since, in 1907, Dr Penna, Director of Public Assistance, reorganizes the service dividing the city into eight radii and installs in each one a vaccination dispensary. The origin the law on vaccination had been a study presented to the Congress of the Nation by Torcuato de Alvear in 1881, due to the popular resistance to vaccination. In the case of smallpox, it had been verified that it attacked native population, as the immigrants had been vaccinated in Europe. Alvear declared that it was not only important to make the proposal compulsory but also make it practical and so as the poor strata were vaccinated it was necessary to perform it in the households (Álvarez, 2004).

European urban sanitation doctrines modified the old Port customs: in 1889, the municipality banned the washing of clothing at the coast, thus the washer-women disappeared from the riverside of the Rio de la Plata. Other measures were also incorporated, such as domiciliary disinfection and the construction of incinerators to burn garbage and the greater importance of the professional practice of medicine of health (vaccination campaigns, domiciliary medical attention and preventive and therapeutic treatments).

As for the evolution of mortality in first infancy, the values presented in graph 6 evidence a notorious decreasing tendency of the mortality rate caused by infectious and parasitic diseases. The level of the rate did not surpass, along this period of study, 40 per thousand, and the participation of these deaths in the total of casualties of children under 5 years of age (table 5) was lower than 20 percent, even in the periods when there were epidemics.

When we analyze the evolution of the rates by age, it is seen that there are not differences in their decreasing tendency, yet indeed in their level. Whereas in infantile mortality the level of the rate does not surpass 13 per thousand, in the case of the children from one to four years of age, the level reaches 26 per thousand. Likewise, it is distinguishable that this group's participation in the casualties of children under 5 is minimal from the 1980-1984 quinquennium.

GRAPH6
MORTALITY BY INFECTIOUS AND PARASITIC DISEASES,
ACCORDING TO AGE GROUP (RATE BY THOUSAND).
CITY OF BUENOS AIRES, 1890-2002



Source: table 5.

Diarrhea and enteritis

It is evident that the beginning of the descent in mortality by diarrhea and enteritis precedes the corresponding therapy. Indeed, plasma-therapy and sulfanilamides start their expansion between the end of the 1930's decade and the early 1940's, whilst the use of antibiotics becomes generalized after WWII. Just in 1985 the municipal hospital system for the treatment and control of summer diarrhea is established and the ambulatory cabinets for oral re-hydration in some hospital of the commune.

Being infantile diarrheas transmittable fundamentally by water and food, its reduction is associated with improvements in urban infrastructure (environmental sanitizing and piped water supply), as well as other measures such as food sanitation, particularly milk, and improvements in the preventive institutional development of public health that influenced on the education of mothers on the children's hygienic cares and nourishment.

The pediatricians in the early XX century repeatedly mentioned the dangers provoked by the mother's ignorance as for infantile cares, hygiene and nourishment. They pointed out that most of the diarrheas were directly related to alimentary problems, being frequently found among children partially or completely weaned, when they began to eat other food different from mother's milk, which generally occurred during the first semester of life (Birn *et al.*, 2005).

The importance of the professional practice of health must be distinguished, specially the action unfold by the dispensaries of lactation, the institutes of child care and maidens' inspection. The dispensaries of lactation were truly schools of mothers: there they were taught the principles of the importance of mother's milk. The mottos engraved in the offices read: "human milk is irreplaceable in small children", "mother's milk is the best food for children" and "mother's milk must belong to the children" (Oliva, 1918: 84).

The evolution of mortality by diarrhea and enteritis, as it can be seen in graph 7, presents a growing tendency during the XIX century, which continues until the 1910-1914 quinquennium, whence it starts an evident negative slope.

The noticeable increment in the 1910's decade was probably caused by the precarious conditions milk was released for public consumption, as a consequence of the inundations in 1914 and 1915, of the drought in 1916 and the railways strike in 1917 (Oliva, 1918).

In respect to this strike, Dr Emilio Coni (1917: 586) wrote:

One must bear in mid that for more than a month—precisely October—there has been in the capital a lack of milk, which I am afraid I cannot express with figures for I do not have them available. Indeed, milk reached exorbitant prices unknown for the annals of Buenos Aires. It is no surprising that the population in need could have lacked for some time this primordial food for the small children when one considers the upper strata had difficulties acquiring it and, even so, at excessive prices. Poor mothers had been forced during the time of the strike to replace milk with other food, which undoubtedly have exercised the pernicious influence evidenced by the bad and eloquent figures of the statistic (Coni, 1917: 586).

By the end of the 1910's decade, in words by Dr Oliva, in the city:

... things have changed, mothers have the most indispensable knowledge on the rational custody of their children and what is more, the conscience of the role their development and health, have the errors that in their alimentary regimes are produced and the advantages caused by the trust in their prescription. Domiciliary inspections the doctors from the nurse office and the inspectors of the dispensaries and the

TABLE 5
MORTALITY RATES (BY THOUSAND), ACCORDING TO AGE GROUP BY CAUSE
OF DEATH. CITY OF BUENOS AIRES, 1890-2002.
MORTALITY IN CHILDREN UNDER ONE YEAR OF AGE

Period	I and P	D and E	RESP	VCC	PE	Rest	Total
1890/94	13.0	10.6	33.1	0.7	15.8	82.6	155.7
1895/99	8.2	16.7	28.7	0.5	12.6	49.9	116.7
1900/04	9.1	31.1	22.6	0.8	10.9	22.2	96.7
1905/09	8.4	31.5	22.2	0.8	10.8	20.9	94.5
1910/14	8.6	39.6	21.4	1.0	12.5	13.0	96.2
1915/19	8.5	33.8	20.6	1.0	13.2	14.9	91.9
1920/24	7.6	27.5	21.8	0.8	11.7	14.8	84.2
1925/29	7.5	23.4	21.6	2.4	9.6	13.3	77.8
1930/34	6.5	14.5	16.9	2.4	11.9	11.0	63.1
1935/39	4.7	11.2	13.4	1.9	13.6	6.6	51.5
1940/44	3.1	8.7	11.0	3.0	14.9	3.2	43.9
1945/49	1.9	5.2	7.5	3.5	15.3	4.4	37.9
1950/54	1.6	1.4	8.0	2.1	13.7	7.9	34.7
1955/59	1.5	1.0	6.3	2.5	15.0	7.4	33.7
1960/64	1.8	2.6	6.3	3.2	15.3	1.9	31.1
1965/69	3.5	2.1	4.4	3.9	18.2	2.6	34.6
1970/74	4.3	1.4	5.2	3.4	13.6	3.1	31.1
1975/79	2.8	0.8	3.3	3.6	12.5	2.8	25.8
1980/84	0.5	0.2	1.7	3.6	10.5	1.8	18.3
1985/89	0.5	0.2	0.9	3.4	9.3	1.5	15.8
1990/94	0.3	0.1	0.7	3.2	8.3	2.1	14.7
1995/99	0.3	0.0	1.1	3.0	5.9	1.9	12.3
2000/02	0.2	0.0	1.2	2.6	4.5	0.9	9.3

P.T.O.

TABLE 5
MORTALITY RATES (BY THOUSAND), ACCORDING TO AGE GROUP BY CAUSE
OF DEATH. CITY OF BUENOS AIRES, 1890-2002.
MORTALITY IN CHILDREN FROM ONE TO FOUR YEARS OF AGE
(CONTINUATION)

Mortality in 1 to 4 years							
Period	I and P	D and E	RESP	VCC	PE	Rest	Total
1890/94	26.4	6.3	33.4	1.1	0.2	40.2	107.4
1895/99	19.6	4.1	28.2	0.3	0.1	37.1	89.3
1900/04	17.6	10.4	20.3	0.3	0.0	27.0	75.7
1905/09	10.9	9.9	21.5	0.2	0.1	17.1	59.6
1910/14	11.0	10.7	19.2	0.2	0.1	13.8	55.0
1915/19	13.2	10.0	21.6	0.3	0.1	15.8	61.0
1920/24	9.2	6.5	16.8	0.1	0.2	12.0	44.9
1925/29	10.8	3.9	13.1	0.2	0.2	12.2	40.5
1930/34	8.3	2.5	9.8	0.1	0.1	7.8	28.6
1935/39	5.8	1.9	6.1	0.1	0.1	5.7	19.7
1940/44	3.7	0.9	2.8	0.6	0.1	3.2	11.3
1945/49	2.1	0.6	1.5	0.5	0.2	2.7	7.5
1950/54	1.2	0.1	1.7	0.3	0.1	3.3	6.7
1955/59	1.4	0.1	1.3	0.1	0.1	3.1	6.1
1960/64	0.8	0.3	0.9	0.2	0.0	2.0	4.4
1965/69	1.2	0.3	1.0	0.4	0.0	1.9	4.6
1970/74	1.0	0.1	0.6	0.3	0.0	1.6	3.6
1975/79	0.7	0.1	0.4	0.3	0.0	1.6	3.2
1980/84	0.2	0.0	0.3	0.3	0.0	1.5	2.3
1985/89	0.2	0.0	0.3	0.3	0.0	1.9	2.8
1990/94	0.1	0.0	0.3	0.3	0.0	1.4	2.1
1995/99	0.1	0.0	0.3	0.4	0.0	1.2	2.0
2000/02	0.1	0.0	0.2	0.2	0.0	0.8	1.3

Source: own elaboration based on vital statistics.

institutes of childcare of the Public Assistance carry out, verify every moment what I hereby state, for everyday the aforementioned employees witness edifying instances in this respect, notwithstanding being poor households and far from the center of the municipality (Oliva, 1918: 69).

Once again the important role of promotion and health control developed by the local government is distinguished.

In this time, on December 13th, 1907, the Ordinance on milk's sanitation, whose 1st Article regulated that as from October 1st the sanitation of milk for the city's consumption would be compulsory; it specified that by sanitized milk it was understood that which after being filtered, had been pasteurized or sterilized. It also established that packages must carry, printed and in a visible place, the name of the factory where the milk had been sanitized (4th article). But reality was different: in the 1960's decade there were still in the city milkmen who distribute the milk in jars, which evidenced lack of hygiene.

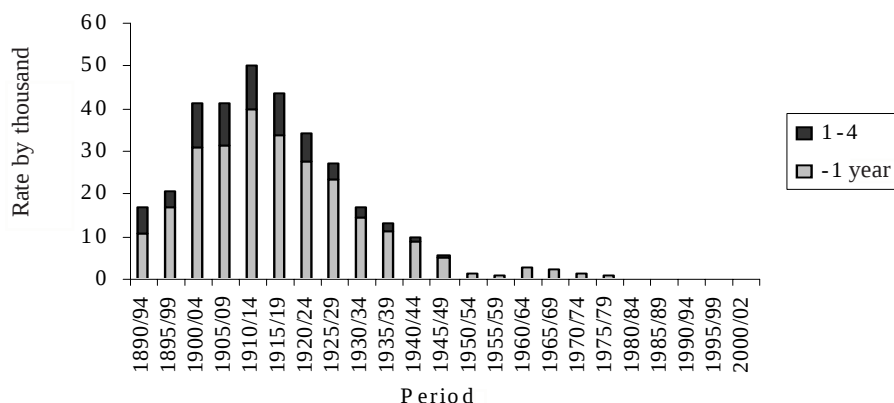
As from 1950, mortality by diarrheas registers very low levels, with a slight increment in the 1960's decade, to finally disappear in the 1980's decade.

Respiratory

Respiratory diseases are of aerobic transmission; hence it is possible to link the greater exposition to contagion to the increment of demographic density, stacking and poor household conditions. A possible explanation of the stagnation and even the increment in mortality by respiratory diseases, in the first decades of the XX century, is to be found in demographic growth. Average annual growth rates between the end of the XIX century and the beginning of XX were close to 50 percent, and from the mid 1930's decade, the city had a moderate growth, being reduced to 20 per thousand in the 1936-1947 period.

The doctors by then emphasized the preeminence of the terrible conditions of life in the popular strata as one of the most relevant factors to understand the heavy incidence of mortality by respiratory causes. The deficiency in the nutritional condition was another of the factors pointed out as aggravating causes. In accordance with the contemporaries, prophylactic measures were rudimentary, the only weapons they had to prevent the infectious processes from ending in severe pulmonary states were: hygiene cares, protection against cold weather, good habitation and healthful alimentation. The evaluation of the medical literature of the epoch allows concluding that:

GRAPH 7
MORTALITY BY DIARRHEA AND ENTERITIS ACCORDING TO AGE GROUP
(RATE BY THOUSAND). CITY OF BUENOS AIRES, 1890-2002



Source: table 5.

...mortality by bronchopneumonia in children and breast children was the great catalyst of processes with infectious origin of diverse nature. In this respect it is worth mentioning, on the one side, the interaction between bronchopneumonias and diarrheas; and on the other, their association with endemic-epidemic diseases, particularly convulsive cough and measles (Birn *et al.*, 2005: 149).

Separately, it is worth mentioning that this is the group which registered the highest values up to the 1930's decade, both for children under one year of age and those from one to four years (graph 8), not existing notorious differences between their levels. Their tendency decreased as from the middle of last century with a slight increment in the 1990's decade. The impulse preventive medicine had in the city from the 1930's and the consolidation of social assistance as medical complement, partly explain the reduction of mortality by respiratory causes in children.

Congenital malformations

Mortality caused by congenital malformations during XX century registered values that did not surpass 1.7 per thousand. During the last century its tendency was steady until the 1925-1929 quinquennium, moment when there is a growing tendency, being the 1965-1969 quinquennium when the peak is reached (4.3 per thousand). This fact would indicate the existence of a better quality in the certification of the cause of death, or a better codification of it, which at the time is related to the greater detail of the included causes in the international classifications of diseased used as from 1930.

First age (peri-natal)

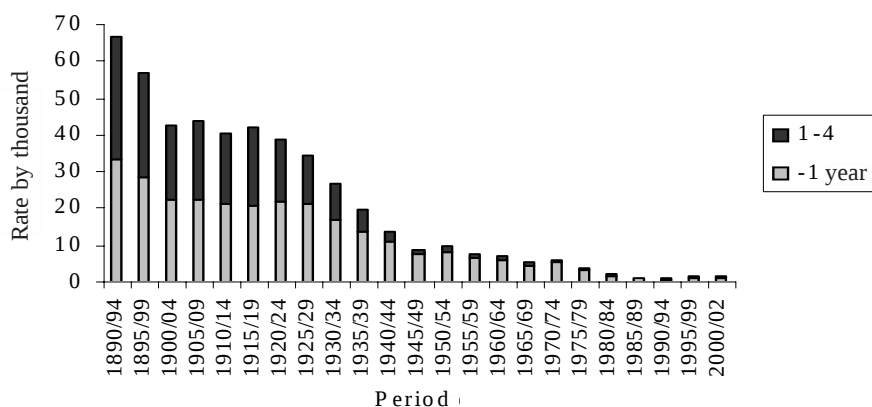
This groups comprehends the affections which have their origins in the peri-natal period even if death occurs later. Causes related to mother's diseases are included, altogether with complications in birth labor or maternal complications in pregnancy which affect the fetus or newly born child, as well as those related to pregnancy duration and fetal growth, birth traumatism, respiratory affections, infections proper to the peri-natal process and other peri-natal disorders (endocrinal and metabolic, hematologic and of the digestive system).

Even if it is considered that for the analysis of the importance of the causes of death in the determination of the mortality level it is not suitable to use a group so broad, it was necessary to do so in order to analyze the historic evolution, since for several years information was published aggregated at chapter level.

During XIX century and until the beginning of the last, this group's mortality rate registers a clearly descending tendency. Last century, it registers cyclic variations (graph 10) with waves of approximately thirty years of amplitude, until 1970's decade when a clear descending tendency starts. This fact would indicate, as in mortality by congenital anomalies, a better quality of death certification or its codification. It is also related with the sustained increment the participation of births in maternal wards, which represented more than 70 percent in the early 1960's and, as it will be mentioned, with the appearance, by the end of said decade, of the Service of Neonatology and in the early 1970's of the program of protection to mother and child.

This sort of causes, due to their etiology (related to pregnancy complications, birth labor and at birth), have a greater participation in deaths of children under

GRAPH8
MORTALITY BY RESPIRATORY DISEASES ACCORDING TO AGE GROUP
(RATE BY THOUSAND). CITY OF BUENOS AIRES, 1890-2002



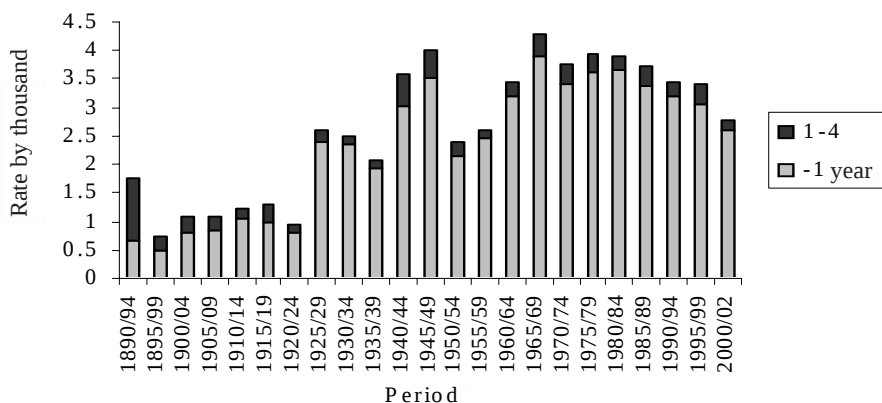
Source: table 5.

a year of age, reaching from the mid XX century, between 40 and 60 percent of the total of infantile mortality. Consequentially, among children from one to four years of age its importance is petty, close to one percent of the women.

The variation of this group's participation along the analyzed period shows, similarly to congenital malformations, an important increment especially from the 1930's decade. This fact validates the existing relation between the descent in the level of mortality and the greater participation of women by exogenous causes.

Likewise, through the analysis of the values registered in table 6. It is observed that up to the early XX century the five groups of causes selected represented 60 percent of the deaths of children under five years of age, whereas from 1905 they were close to 80 percent of the cases. It is notorious the modification of the structure of causes as from 1930 and especially after 1950. The reduction in the proportion of death by exogenous causes (infectious and parasitic, diarrhea and enteritis and respiratory) is evident as well as the progressive importance the deaths caused by endogenous causes (congenital and peri-natal anomalies) acquire, the latter reaching 68 percent of the deaths of

GRAPH9
MORTALITY BY CONGENITAL MALFORMATIONS ACCORDING TO AGE
GROUP (RATE BY THOUSAND). CITY OF BUENOS AIRES, 1890-2002



Source: table 5.

children under one year in the 1990-2002 period. These values prove that the general descent in infantile mortality mainly was due to the reduction of deaths of exogenous origin. In the category 'rest of causes', which was from the early last century close to 20 percent, one finds, among others, deaths by accidents, cardiac and renal affections and tumors.

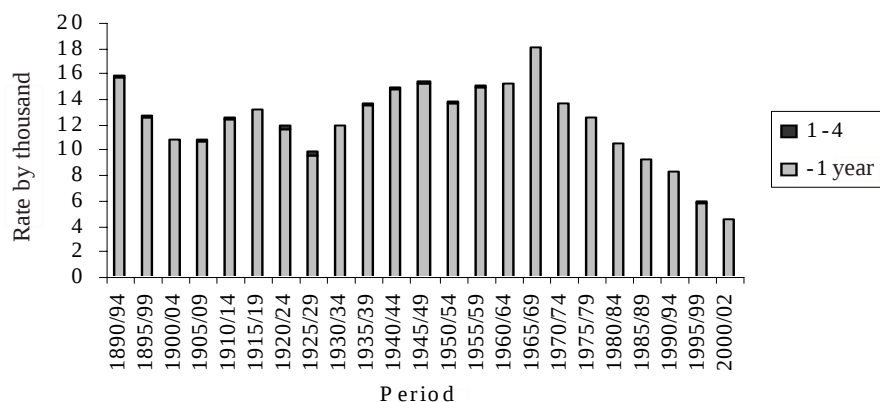
As a conclusion

First infancy mortality level in Buenos Aires was reduced 97 percent in a period of more than a hundred years. At the beginning of the period it was above 300 per thousand, a century later it was 35 per thousand and almost forty years later it is under 11 per thousand.

The analysis of the structure by age demonstrated that the larger mortality rate the larger participation of post-neonatal and of children from one to four years of age deaths, and the lower the level the greater participation of neonatal deaths.

The changes experienced by the structure of causes by death which accompanied the descent of mortality evidenced, from the 1950's decade, the

GRAPH10
MORTALITY BY PERI-NATAL CAUSES ACCORDING TO AGE GROUP (RATE BY THOUSAND). CITY OF BUENOS AIRES, 1890-2002



Source: table 5.

reduction of the proportion of deaths by exogenous causes, which represented 68 of the deaths in the 1990-2002 period. This fact allows concluding that the descent in infantile mortality was due to the reduction of exogenous deaths, in particular those caused by infectious, parasitic diseases and diarrhea and enteritis.

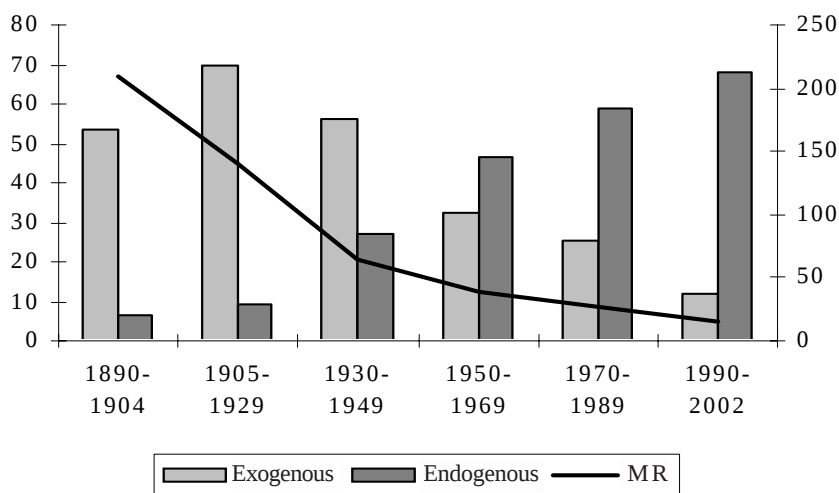
In the understanding that the behavior of mortality is integrant part of a more complex social process and that it is the concrete historical process of society indeed that which provides meaning to mortality inserted in it, the analysis of the socio-political framework, as well as that of the policies and programs, allowed indentifying some explanatory factors related to the tendency of maternal-infantile mortality. In this sense it is fundamental that people responsible for health policies understand the social process currently undergoing, thus they will be able to comprehend and critically analyze the most adequate means for the programs and actions to be more effective.

TABLE 6
FIRST INFANCY MORTALITY STRUCTURE, ACCORDING TO SELECTED CAUSES.
CITY OF BUENOS AIRES, 1890-2002

Cause	1890-1904	1905-1929	1930-1949	1950-1969	1970-1989	1990-2002
Mortality rate (by thousand)						
Total	209.5 100.0	140.8 100.0	64.0 100.0	39.4 100.0	26.2 100.0	14.4 100.0
Total selected causes	60.3	79.2	83.2	78.8	84.6	79.7
Subtotal of exogenous	53.6	69.9	56.2	32.2	25.6	11.8
Infectious and parasitic	14.6	13.6	13.4	7.9	10.2	2.8
Diarhea and enteritis	13.1	28.0	17.0	4.6	2.8	0.4
Respiratory	25.9	28.3	25.8	19.7	12.6	8.6
Subtotal of endogenous	6.7	9.3	27.0	46.6	59.0	67.9
Congenital malformations	0.5	1.0	4.9	7.7	14.6	22.8
First age (peri-natal)	6.2	8.3	22.1	38.9	44.4	45.1
Rest of causes	39.7	20.8	16.8	21.2	15.4	20.3

Source: own elaboration based on vital statistics.

GRAPH 11
FIRST INFANCY MORALITY RATE AND STRUCTURE
ACCORDING TO SELECTED CAUSES. CITY OF BUENOS AIRES, 1890-2002



Source: table 6.

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