THE DISTRIBUTION OF TETANUS IN ARGENTINA[1]

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Significant numbers of tetanus cases and deaths from neonatal tetanus occur in Argentina every year. This article describes climatic and seasonal factors affecting tetanus incidence there and points to areas (case registration and reporting, immunization of pregnant women) where measures being taken against the problem could be improved.

Introduction

The incidence of tetanus can be analyzed in terms of population variables (such as age and place of residence) and also in terms of environmental conditions (such as soil type and climate), thus shedding light on some of the disease's epidemiologic features *(1)*. Indeed, information about the occurrence of tetanus in a country's various political subdivisions, and about tetanus morbidity and mortality in different age groups, provides an essential basis for setting control program implementation and evaluation priorities *(2)*.

Geographic, Climatic, and Seasonal Variations

Geography

Table 1 shows the number of tetanus cases reported in Argentina during the years 1965-1977, the estimated population in the middle of each year, and the tetanus incidence per 100,000 population *(3)*. As can be seen, the reported incidence generally fluctuated between 1.2 and 1.7 cases per 100,000 although in 1967 the rate rose to 3.1 per 100,000—apparently as a result of an important reorganization and temporary improvement of the national reporting system.

Table 2 shows average rates by political subdivision for the period 1967-1977. The overall incidence for the whole country in this period was 1.6 cases per 100,000 population, but large differences occurred in various political subdivisions. By and large, the lowest rates were found in the southern parts of the country. Figure 1 indicates the variations in data reported from different areas.

Table 1. Reported tetanus cases in Argentina and incidence per 100,000 population, by year, for 1965-1977.

Year	No. of cases	Population (in thousands)[a]	Incidence per 100,000 population
1965	454	21,595	1.2
1966	565	21,928	1.5
1967	706	22,266	3.1
1968	405	22,602	1.7
1969	348	22,940	1.5
1970	399	23,316	1.7
1971	336	23,722	1.4
1972	341	24,138	1.4
1973	362	24,563	1.4
1974	321	24,999	1.2
1975	331	25,383	1.3
1976	376	25,719	1.5
1977	335	26,056	1.3

[a]Estimates based on adjustments to the demographic census of 1970.

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Climate

As many authors have pointed out, high tetanus incidences are closely associated with hot, humid climates and fertile soil. Thus, the highest tetanus morbidity and mortality are generally observed in tropical countries, where the cold seasons encountered elsewhere do not exist *(1)*.

Table 2 also shows the influence of climate. Although provincial incidences within a given climatic zone may be very different, a general comparison of rates by type of climate shows that the highest rates are associated with the subtropical region, the intermediate rates tend to be associated with the temperate region, and the lowest rates occur in the cold region.

Rainfall in Argentina tends to decrease as one moves from east to west and from north to south. Whether the countryside consists of farmlands, grazing areas, or uncultivated terrain depends largely on these rainfall patterns *(4)*. Though it is not possible to precisely correlate the reported incidence rates with such rainfall and land use patterns, Figure 1 shows that the provinces with the lowest reported incidences are in the arid western or southern regions. It should also be noted, however, that some of the variations found—particularly between areas with similar climates and land use patterns—presumably relate to underreporting of the disease.

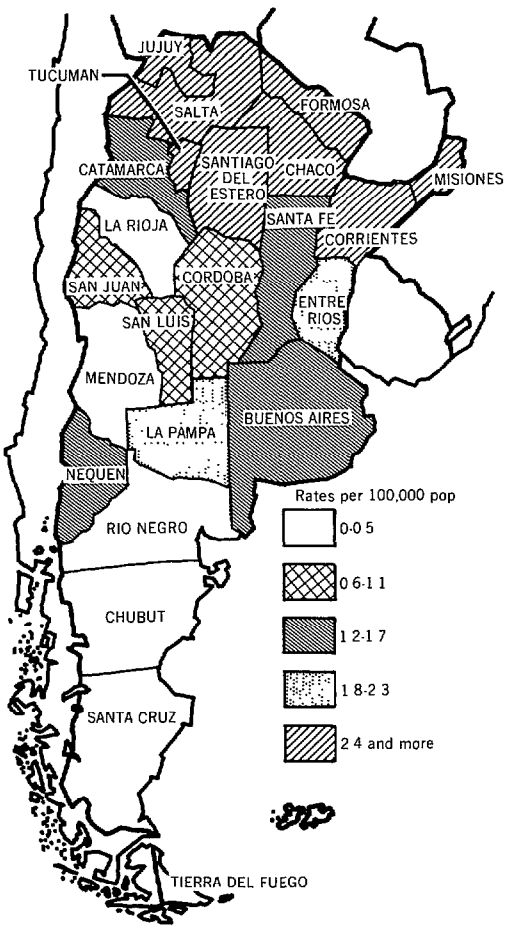
The Seasons

Epidemiologic studies in various countries have shown a definite seasonal distribution of tetanus cases that seems associated with

Table 2. Reported tetanus cases by province in 1967-1977, showing basic climatic divisions, average number of cases per year, provincial populations at the middle of the reporting period, and the average annual tetanus incidence per 100,000 population.

Political division and climate	No. of reported tetanus cases, 1967-1977	Average cases per year	Population (in thousands) at middle of reporting period	Average annual tetanus incidence per 100,000 population
Subtropical region	*1,825*	*165.8*	*4,221*	*3.9*
Catamarca	38	3.4	175	1.9
Corrientes	211	19.2	587	3.3
Chaco	424	38.5	572	6.7
Formosa	154	14.0	248	5.6
Jujuy	74	6.7	323	2.1
Misiones	168	15.3	470	3.3
Salta	224	20.4	533	3.8
Santiago del Estero	173	15.7	519	3.0
Tucumán	359	32.6	794	4.1
Temperate region	*2,394*	*217.6*	*19,409*	*1.1*
Federal district	203	18.5	2,974	0.6
Buenos Aires	1,231	111.9	9,289	1.2
Córdoba	230	20.9	2,177	1.0
Entre Ríos	181	16.5	838	2.0
La Pampa	43	3.9	177	2.2
La Rioja	7	0.6	139	0.4
Mendoza	50	4.5	1,025	0.4
San Juan	34	3.1	403	0.8
San Luis	17	1.5	187	0.8
Santa Fe	398	36.2	2,200	1.6
Cold region	*41*	*3.7*	*762*	*0.5*
Chubut	7	0.6	202	0.3
Neuquén	18	1.6	170	0.9
Río Negro	14	1.3	281	0.5
Santa Cruz	2	0.2	94	0.2
Tierra del Fuego	0	0.0	15	0.0

Figure 1. Reported tetanus morbidity per 100,000 population, by political divisions, showing the annual average over the period 1966-1977.



weather, humidity, and farming activities. In the United States, for example, the highest tetanus incidence occurs in the summer months, and this trend is more evident in the northern and western areas than in the southeastern part of the country.

Heath et al. feel that this difference results from seasonal variations in the climate and accompanying changes in the degree of exposure to the agent. That is, in the southeastern United States, where seasonal variations are less marked, the degree of exposure to the agent changes less throughout the year *(5)*. In a similar fashion, Japanese data show that more patients with tetanus are admitted to hospitals during the summer months *(1)*.

A similar trend can be found by examining hospital admissions for tetanus in the city of Buenos Aires during the period 1968-1973 *(6)*, as shown in Table 3. If one considers these admissions by quarter, as defined below, the average number of admissions was highest in the first and fourth quarters and lowest in the second and third. In conformity with the seasonal pattern of the Southern Hemisphere, the first quarter includes the hottest months and the third quarter includes the coldest.

Quarter	Average no. of admissions annually, 1968-1973
First (December-February)	38.3
Second (March-May)	32.5
Third (June-August)	27.2
Fourth (September-November)	34.3
Total	132.2

The data thus show a clear seasonal trend, with maximum values occurring in the summer months, as shown in Figure 2.

Buenos Aires Morbidity and Mortality

During the 1968-1973 period there were 1,160,028 hospital discharges in the city of Buenos Aires. The final diagnoses of these municipal hospital cases indicated that the cause of admission was tetanus in 802 cases (0.06 per cent). The case-fatality ratio for tetanus in the same hospitals was 35.8 per cent. One facility, the Muñiz Hospital, accounted for 83.3 per cent of all the discharged tetanus patients in this period, even though this hospital only cared for 1.3 per cent of the patients discharged by municipal hospitals in Buenos Aires. The case-fatality ratio for tetanus cases at the Muñiz Hospital in this period was 32.5 per cent *(7)*. Comparable data are not available for the period 1973-1977 because of serious shortcomings in the reporting system *(8)*.

Table 3. Distribution of tetanus cases admitted to municipal hospitals in Buenos Aires by month, showing seasonal variations.

	No of cases per month indicated											
Year	Jan.	Feb.	March	April	May	June	July	Aug.	Sept	Oct	Nov	Dec.
1968	10	10	4	6	13	6	8	12	14	11	10	8
1969	10	15	13	11	19	7	11	7	14	20	15	17
1970	17	10	11	21	8	15	12	13	14	8	21	23
1971	16	16	13	10	11	4	10	9	4	12	5	13
1972	17	8	4	16	9	11	4	14	6	13	11	10
1973	8	11	9	9	8	7	6	7	10	10	7	11
Total cases	78	70	54	73	68	50	51	62	62	74	69	82
Monthly average	13.0	11.7	9.0	12.2	11.3	8.3	8.5	10.3	10.3	12.3	11.5	13.7

The Buenos Aires hospital data also show that mortality was many times greater among infants less than 15 days old than it was among the population as a whole (Table 4). According to these data, the average Buenos Aires resident had anywhere from 1.3 to 2.3 chances in 100,000 of dying from tetanus in a year, while the average newborn had anywhere from 8.5 to 17.1 chances in 100,000 of dying from tetanus in the first 15 days of life. Such findings, together with evidence that neonatal tetanus produces a very high case-fatality ratio, constitute the main reason for advocating prevention of the disease among newborns through full immunization of pregnant women.

Figure 2. Seasonal variations in the number of tetanus patients admitted to municipal hospitals in Buenos Aires, by quarter-year, for 1968-1973.

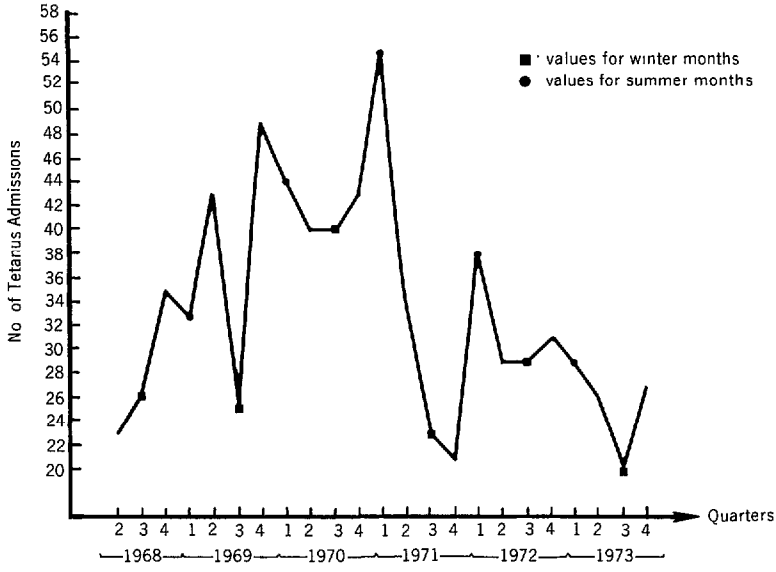


Table 4. Tetanus mortality among newborns and the general population at municipal hospitals in Buenos Aires, 1968-1973, by year.

	Population < 15 days of age			Total population		
Year	No. of deaths in first 15 days of life	No. of newborns	Deaths per 100,000 newborns	No. of deaths per year	Buenos Aires population	Deaths per 100,000 population
1968	11	78,666	14.0	40	2,969,974	1.3
1969	9	83,860	10.7	51	2,970,791	1.8
1970	15	87,928	17.1	67	2,893,299	2.3
1971	8	94,128	8.5	44	2,900,284	1.5
1972	9	91,892	9.8	40	2,907,236	1.4
1973	10	—	—	45	2,914,204	1.5

Conclusions

The annual incidence of reported tetanus cases in Argentina, for the period 1965-1977, ranged from 1.2 to 1.7 per 100,000 inhabitants in every year except 1967. The data for the latter year show a higher incidence (3.1 cases per 100,000), apparently because of a temporary improvement in the reporting system. In a similar vein, there is a close correlation between average annual tetanus incidence and major climatic regions, the incidence being highest in the subtropical region, intermediate in the temperate region, and lowest in the colder region. Nevertheless, the data reported by individual provinces within each region show wide fluctuations from one province to the next. These two things, the increased incidence of 1967 and the provincial rate variations, both suggest significant deficiencies in the system for registering and reporting tetanus cases within the country.

Data from the municipal hospitals of Buenos Aires for 1968-1973 show that the number of tetanus patients tended to increase during the warmer months. They also indicate high mortality from tetanus among infants less than 15 days of age. Virtually all of such neonatal tetanus morbidity and mortality could be prevented by immunization of pregnant women—who at present do not receive satisfactory tetanus immunization coverage.

SUMMARY

Available data on tetanus in Argentina for the period 1965-1977 indicate an overall national case-rate generally ranging from 1.2 to 1.7 cases per 100,000 inhabitants per year. A close correlation can also be observed between tetanus incidence and climate, the incidence tending to be higher in warmer and wetter areas. In addition, data from Buenos Aires hospitals indicate that a disproportionate share of tetanus cases occur during the summer (December-February) months.

Taking a closer look at these data, it may be seen that considerable fluctuations occurred among different provinces in the same climatic region and that an unusually high national case-rate of 3.1 cases per 100,000 population was reported in one year (1967). These findings suggest significant deficiencies in the system for registering and reporting tetanus cases in Argentina.

Finally, the Buenos Aires hospital data indicated relatively high mortality from neonatal tetanus, on the order of 9-17 deaths per 100,000 live births, among infants 0-14 days of age. Illness and death from this cause could be prevented by immunizing pregnant women—who at present do not receive satisfactory tetanus immunization coverage.

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HUMAN PLAGUE IN 1980

A total of 505 plague cases and 56 plague-related deaths were reported to the World Health Organization in 1980. The corresponding figures for 1979 were 881 and 30, respectively. Most of the reported 1980 cases (283) and deaths (29) occurred in Asia; 80 cases and 20 deaths were reported in Africa; and 142 cases and seven deaths were reported in the Americas.

The 1980 figures for the Americas indicate a recrudescence since 1979, when 23 cases and two deaths were reported. The increase in morbidity was due to an outbreak in Brazil (98 cases but no deaths), which was most marked in the northeastern states of Ceará, Bahia, and Pernambuco.

Between September and November 1980 a total of 26 cases, two of them fatal, were observed in Bolivia's La Paz Department, in the localities of Mohima (20 cases) and Culata (6 cases) in Franz Tamayo Province. A high density of the flea *Pulex irritans* was found in these two localities.

In the United States, the three states of New Mexico, Nevada, and California reported 18 cases and five deaths in 1980. Thirteen of these cases occurred in six New Mexico counties between May and September.

Source: World Health Organization, *Weekly Epidemiological Record* 56:273 and 280, 1981.