

Variation in number of infant deaths by day of week in one county during the ten-year-period 1969-1978

by

P. CHOLNOKY, E. BALOGH

Department of Paediatrics, Markusovszky Hospital,
Szombathely

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The data of all infant deaths occurring in county Vas during the years 1969-1978 were examined to discover eventual variations in the number of deaths by the day of week. A minimum value was found for Thursday and a maximum for the first two or three days of the week. The variation may be attributed to uneven health care facilities varying throughout the week.

The rate of infant mortality is influenced by a broad spectrum of factors. In earlier decades the seasonal variation was pronounced; one of the greatest achievements of infant care has been the abolition of the summer maximum due to mortality caused by gastrointestinal infection and the flattening of the winter peak reflecting the effect of acute respiratory diseases.

Little attention has been paid to cyclic variations independent of seasonal changes. Since long, the weekly cycle has lost its relationship to natural influences, it may thus be anticipated that any demonstrable variation of infant mortality on certain days of the week has to be ascribed to human factors. At regular evaluations of infant mortality we had the impression that an undue number of infants die on weekends; this has prompted us to examine the effect of the day of week on infant mortality.

MATERIAL AND METHODS

Data of all infants aged less than one completed year having died in County Vas (total number of inhabitants, 280,000) during the period between January 1, 1969, and December 31, 1978, have been collected from the health visitors' reports. A total of 1022 infants deaths occurred during those years. The cases were grouped as follows.

1. According to age at the time of death: 0-6 days and 7-365 (in leap years, 366) days.

2. In the group of infants who died after the first week of life, those who died at home and/or unexpectedly or of a disease obviously accessible to medical treatment within 24 hours after admission to hospital, were separated ("unacceptable" vs. "acceptable" deaths).

3. The infants were divided according to their place of residence (town of Szombathely, the seat of the county hospital vs. the rest of the county).

4. According to the day of week on which the death occurred. The original day of week was modified in the following cases:

a. All paid work-free holidays were regarded as Sundays (January 1, April 4, Easter Monday, May 1, August 20, November 7, Christmas-day, Boxing-day).

b. All days immediately preceding the above mentioned days were regarded as Saturdays except if they were Sundays.

c. If the weekly work-free day was transferred from Sunday to another day because of the vicinity of a holiday, the new work-free day was regarded as Sunday and the original Sunday as a day of week with which it was exchanged. Therefore, the 3652 days of the ten years were not distributed evenly among the days of the week: there were 508 Mondays, 510 Tuesdays, 511 Wednesdays, 503 Thursdays, 505 Fridays, 527 Saturdays and 588 Sundays.

5. The patients dying within the first week of life were also grouped according to the day of week on which they had been born. The same principles of modification were observed as described above.

The actual numbers for each day of week were then compared with the values expected on the basis of ineffectiveness of the day of week, by use of the χ^2 -test.

RESULTS

Tables I to III show the data for the whole county, for the town Szombathely and for the county outside Szombathely, grouped by age at death and by day of week of death.

It can be seen that there is a variation within the week, the minimum number of deaths occurring in most groups on Thursday. Unexpectedly, the observed number of deaths corresponded with the expected value on Friday, Saturday and Sunday, while there was an excess on Monday, Tuesday and Wednesday. The level

of significance was attained or approached only in some columns: in those of total infant deaths of the whole county and of the county minus town Szombathely and in that of infants who died of an "acceptable" cause in Szombathely after the first week of life. The trend is obvious and the fact that the lowest p values were found in the groups comprising the highest number of cases suggests that an extension of the investigation would be promising. For this reason the data were not further broken down although important changes in pattern could be anticipated.

The results are illustrated in Figs. 1a, 1b and 1c. Since the same trend was observed in the figures concerning death within the first week of life, the day of birth of these infants was established.

Table IV demonstrates that the distribution of birthdays of the dead along the week showed a similar pattern with the difference that both the maximum and the minimum occurred about one day earlier: the smallest number of deaths was found among the neonates born on Wednesday and Thursday and the tallest columns were seen on Sunday, Monday and Tuesday. This was expected since the majority of deaths within the first week occurred on the first day of life. It is interesting that the variation by day of week could be observed only outside the town Szombathely; in the town itself there was no variation of this kind. This is illustrated in Figs 2a, 2b and 2c.

TABLE I

Number of infant deaths by age and by day of week, County Vas, 1969—1978

Day of week	Age at time of death, in days				Total
	0—7	7—364(365)			
		Acceptable	Inacceptable	Total	
Monday	123 (112.7)	25 (20.0)	10 (9.5)	35 (29.5)	158 (142.2)
Tuesday	126 (113.1)	23 (20.1)	12 (9.5)	35 (29.6)	161 (142.7)
Wednesday	126 (113.3)	24 (20.2)	9 (9.5)	33 (29.7)	159 (143.0)
Thursday	87 (111.6)	20 (19.8)	5 (9.4)	25 (29.2)	112 (140.8)
Friday	111 (112.0)	19 (19.9)	6 (9.4)	25 (29.3)	136 (141.3)
Saturday	110 (116.9)	14 (20.8)	10 (9.8)	24 (30.6)	134 (147.5)
Sunday	127 (130.4)	19 (23.2)	16 (11.0)	35 (34.1)	162 (164.6)
Total	810	144	68	212	1022

 χ^2 : 9.740 5.402 6.317 5.069 13.256

d. f.: 6

p less than 0.2 0.5 0.4 0.5 0.05

The numbers in brackets show the expected values

TABLE II

Number of infant deaths by age and by day of week, Town Szombathely, 1969—1978

Day of week	Age at time of death, in days				Total
	0—7	7—364(365)			
		Acceptable	Inacceptable	Total	
Monday	35 (33.5)	10 (5.7)	3 (2.9)	13 (8.7)	48 (42.2)
Tuesday	37 (33.7)	5 (5.6)	4 (2.9)	9 (8.6)	46 (42.2)
Wednesday	40 (33.7)	7 (5.7)	1 (2.9)	8 (8.7)	48 (42.4)
Thursday	28 (33.2)	4 (5.7)	3 (2.9)	7 (8.6)	35 (41.7)
Friday	33 (33.3)	8 (5.7)	2 (2.9)	10 (8.6)	43 (41.9)
Saturday	38 (34.8)	0 (5.9)	2 (3.0)	2 (9.0)	40 (43.7)
Sunday	30 (38.8)	7 (6.6)	6 (3.4)	13 (9.9)	43 (48.8)
Total	241	41	21	62	303

 χ^2 : 4.674 10.897 4.334 9.077 4.006

d. f.: 6

p less than 0.6 0.1 0.7 0.2 0.7

The numbers in brackets show the expected values

TABLE III

Number of infant deaths by age and by day of week, County Vas
without Town Szombathely, 1969—1978

Day of week	Age at time of death, in days				Total
	0—7	7—364(365)			
		Acceptable	Inacceptable	Total	
Monday	88 (79.1)	15 (14.3)	7 (6.5)	22 (20.9)	110 (100.0)
Tuesday	89 (79.5)	18 (14.4)	8 (6.6)	26 (20.9)	115 (100.4)
Wednesday	86 (79.6)	17 (14.4)	8 (6.6)	25 (21.0)	111 (100.6)
Thursday	59 (78.4)	16 (14.2)	2 (6.5)	18 (20.7)	77 (99.0)
Friday	78 (78.7)	11 (14.2)	4 (6.5)	15 (20.7)	93 (99.4)
Saturday	72 (82.1)	14 (14.9)	8 (6.8)	22 (21.6)	94 (103.8)
Sunday	97 (91.6)	12 (16.6)	10 (7.6)	22 (24.2)	129 (115.8)
Total	569	103	47	150	729

χ^2 : 9.002 3.693 6.176 4.176 11.938

d. f.: 6

p less than 0.2 0.8 0.5 0.6 0.1

The numbers in brackets show the expected values

TABLE IV

Day of birth of infants who died the first week of life

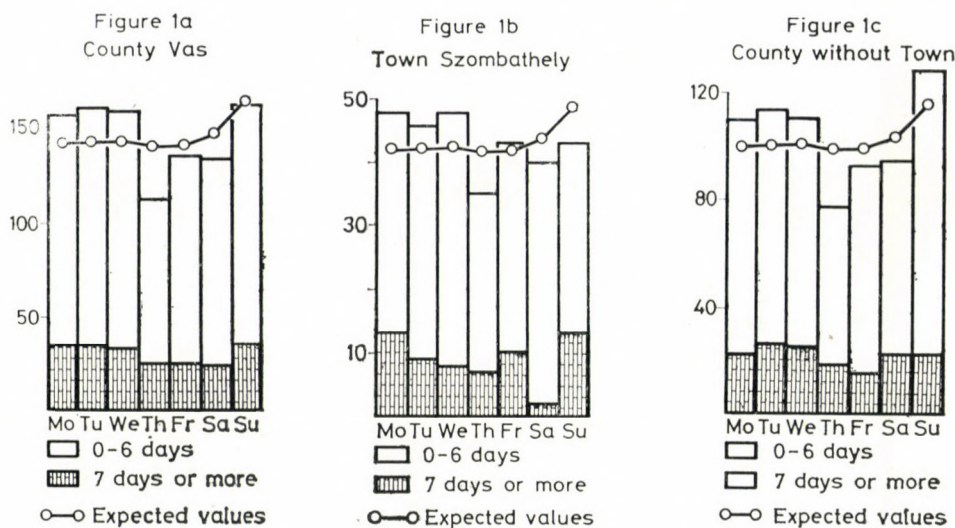
Day of week	County Vas without Town Szombathely	Town Szombathely	County Vas
Monday	95 (79.1)	30 (33.5)	125 (112.7)
Tuesday	93 (79.5)	40 (33.7)	133 (113.1)
Wednesday	69 (79.6)	34 (33.7)	103 (113.3)
Thursday	59 (78.3)	32 (33.2)	91 (111.6)
Friday	76 (78.7)	34 (33.3)	111 (112.0)
Saturday	82 (82.1)	38 (34.8)	120 (116.9)
Sunday	95 (91.6)	32 (38.8)	127 (130.4)
Total	569	241	810

χ^2 : 11.901 3.186 9.757

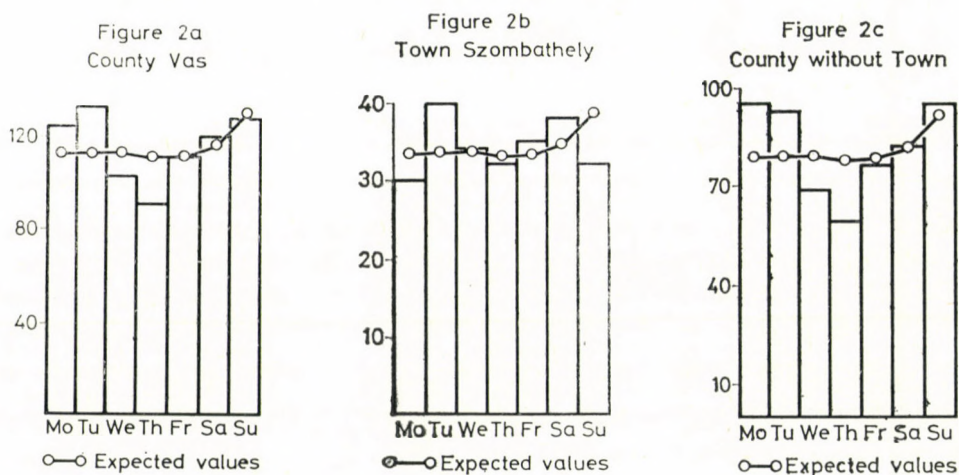
d. f.: 6

p less than 0.10 0.7 0.15

The numbers in brackets show the expected values



FIGS. 1a, 1b and 1c. Number of infant deaths by day of week, 1969-1978



FIGS. 2a, 2b and 2c. Day of birth of infants who died in the first week of life

DISCUSSION

The data show that less infants died on Thursdays than on the first days of the week. The difference was more pronounced in infants residing outside the town. The effect of the

day of week on infant death has been studied by Stanley and Alberman [2] who found a higher mortality rate for very low birth weight newborns on week-ends. Tyson et al. [3] observed in a perinatal centre that more babies died during night-duty than

at daytime and on week-ends than on other days. Macfarlane [1] examined the intra-week variation of perinatal mortality of England and Wales in the years 1970–1976. She found the highest perinatal mortality rates on Sundays and Saturdays. She also observed that on these days of the week with the advance of time a marked relative deterioration of perinatal mortality rate occurred although the overall value improved steadily over the seven-year-period examined. The number of births too showed an increasingly large variation within the week. In 1970, the figures for Sunday were lower by 12% than the average, the relative difference rose to about 25% by 1976; even lower values were found on Christmas-day. These findings were explained by the spreading custom of programmed labour. The intra-week variation of newborn death rates in hospitals was attributed to the uneven staffing over the week [2, 3]. The findings based on national scale data [1] can be explained in two ways. Poor staffing on week-ends is one of the possible explanations, confirmed by the fact that both the number and rate of stillbirths are higher on Saturdays and Sundays than on other days. A second possibility is that the increasing use of elective interventions such as induced labour or elective Caesarean section may have resulted in a shift of births of good prognosis to workdays, leaving an unchanged number of spontaneous deliveries of poorer prognosis to occur on week-ends.

In the present study the intra-week variation could not be examined for a possible relationship to the variation in number of births by the day of week since no such data are available. Still, the minimum number of deaths on Thursday and the maximum on the first days of the week point to uneven health care. Similarly, uneven facilities may have led to the different degrees of variation in the number of infant deaths between the town and the rest of the county.

CONCLUSIONS

A variation in the number of infant deaths by the day of week could be demonstrated even within a small region like county Vas which comprises less than 3% of the inhabitants of Hungary.

The variation was most probably due to uneven health care facilities.

Even a ten years' material of a single county is a sample too small for more detailed analysis. It is therefore advisable that similar evaluations be performed on a national scale; their results promise to be of great practical value.

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P. CHOLNOKY, M. D.
Markusovszky Hospital
H-9700 Szombathely, Hungary