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REFERENCES

- Bill, A. H., and Posey, F. M. (1944). *Amer. J. Obstet. Gynec.*, **48**, 405.
 Brandstrup, E., and Okkels, H. (1938). *Acta obstet. gynec. scand.*, **18**, 136.
 Herrick, W. W., and Tillman, A. J. B. (1938). *Surg. Gynec. Obstet.*, **66**, 37.
 Lawrence, R. D., and Oakley, W. (1942). *Quart. J. Med.*, n.s., **11**, 45.
 — (1944). *British Medical Journal*, **1**, 422.
 Skipper, E. (1933). *Quart. J. Med.*, n.s., **2**, 353.
 White, P., and Hunt, H. (1943). *J. clin. Endocrin.*, **3**, 500.
 Wilder, R. M., and Parsons, E. (1928). *Colorado Med.*, **25**, 372.
 Williams, J. W. (1909). *Amer. J. med. Sci.*, **137**, 1.

MORTALITY IN CHILDHOOD DURING 1920-38

BY

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During the inter-war period considerable success had attended the efforts to reduce mortality, particularly in the first years of life. It seems of interest to review briefly the trend of childhood mortality during the 20 years of peace, since with the prospects of a continued decline in the size of the child population, and the wastage of young adult life due to war, the health and welfare of the child population will become of still greater importance to the nation in the future. The death rates in England and Wales during the first 15 years of life, for males and females for four periods covering 1920-38, are given in Table I. Mortality declined at each age throughout that

TABLE I.—Death Rates per 1,000 from All Causes: England and Wales

Ages	Males				Females			
	1920-4	1925-9	1930-4	1935-8	1920-4	1925-9	1930-4	1935-8
0-	86.9	79.8	70.8	63.5	66.9	61.6	54.3	48.9
1-	23.0	20.9	14.8	10.2	20.8	18.8	13.0	8.9
2-	9.7	8.7	6.5	4.7	9.1	8.1	5.9	4.3
3-	6.0	5.3	4.4	3.5	5.7	5.0	4.1	3.1
4-	4.5	4.0	3.6	3.0	4.3	3.7	3.4	2.7
5-	4.0	3.6	3.5	3.0	4.0	3.3	3.1	2.6
6-	3.2	2.7	2.7	2.4	3.0	2.6	2.5	2.2
7-	2.6	2.3	2.2	1.9	2.4	2.1	1.9	1.7
8-	2.1	2.1	1.8	1.5	2.0	1.8	1.7	1.5
9-	1.9	1.8	1.6	1.4	1.8	1.6	1.5	1.3
10-	1.8	1.6	1.5	1.3	1.7	1.4	1.3	1.1
11-	1.7	1.6	1.4	1.2	1.6	1.4	1.3	1.1
12-	1.7	1.5	1.4	1.2	1.7	1.5	1.4	1.1
13-	1.7	1.6	1.5	1.3	1.9	1.6	1.5	1.2
14-	1.9	1.8	1.7	1.5	2.1	1.8	1.6	1.3

period; the greatest relative improvement occurred at ages 1-2 and 2-3, in which the rates had been more than halved. At ages 3-4 the death-rate had decreased by over one-third, and there was an improvement of one-quarter in the infant mortality rate. A slight difference occurred in the relative trends of the mortality of boys and girls during this period. The minimum death rate for girls during 1920-4 was at age 11, but during 1935-8 mortality did not increase until age 13. There was no corresponding change in the trend of the boys' mortality, and as a consequence the death rate for girls aged 13 and 14 in 1935-8 was below that of the boys, while in 1920-4 the boys had a slightly lower rate at these ages than the girls. The mortality at age 5 showed an interesting trend: in the first period the death rate at this age declined by a smaller amount than in the preceding or succeeding age. This kink in the curve has become more pronounced, and in the last period the mortality at age 5 showed no improvement on that of age 4. This break at age 5 in the downward curve of mortality may be due to the greatly increased risk of infection that confronts children on entering school life, or it may be of significance as indicating a hiatus in child welfare.

Infant Mortality

Before considering childhood mortality by cause of death it is convenient to examine the mortality of infants, since the bulk of these deaths are attributed to causes peculiar to the

first year of life. The great improvement in infant mortality has arisen mainly from the decrease in deaths from infectious and general diseases. The mortality from diseases peculiar to infancy has undergone only a slight improvement. The rates for various causes are shown in Table II.

TABLE II.—Infant Mortality in England and Wales

	All Causes	Congenital Malformation; Congenital Debility; Premature Birth; Injury at Birth	Violence	Infectious and General Diseases
1920-4 ..	77.1	33.8	0.95	42.4
1925-9 ..	70.9	32.2	0.99	37.7
1930-4 ..	62.7	32.2	1.16	29.3
1935-8 ..	56.4	30.6	1.12	24.7

The fall in the rates of the second column was due to the decline of mortality from congenital debility from 8.09 in 1920 to 1.76 in 1938. A matter for concern is the steady rise in deaths due to injury at birth—from 1.22 in 1920 to 2.59 in 1938. A similar trend has been shown by the United States of America, where the mortality from injury at birth rose from 3.9 in 1920 to a peak of 5.3 in 1930 and then declined slightly to 4.8 in 1939. It seems rather ironical that, despite the efforts to reduce mortality, the death rates from violence should increase. In terms of rates the difference of 0.17 between the first and last periods is small, but if there had been no increase 410 fewer babies would have been killed during 1935-8.

Although infant mortality has steadily improved since the beginning of the present century, when the rate was 160 per 1,000 births, a considerable improvement can still be effected. This is shown by comparison with the mortality rate in other countries:

Country	Infant Mortality, 1935-9	Country	Infant Mortality, 1935-9
New Zealand ..	32	Denmark ..	64
Holland ..	38	Germany ..	64
Australia ..	39	France ..	66
Norway ..	40	Canada ..	67
Sweden ..	43	Belgium ..	75
U.S.A. ..	49	Scotland ..	76
England and Wales ..	55	Italy ..	103

The infant mortality rate of New Zealand is only a little more than half that of England and Wales. In the United States infant mortality has declined faster than in this country. The rates for 1920 and 1939 were 86 and 44 in the U.S.A. and 80 and 55 in England and Wales. A similar difference in trend occurred between London and New York. The rates for London fell from 76 in 1920 to 47 in 1939, while those for New York were 85 and 37. In 1939 the rates for each of the five boroughs of New York were below the rate for London. The values were: Manhattan, 45.7; Queens, 36.5; Brooklyn, 34.9; the Bronx, 32.1; and Richmond, 31.0. It is not possible to assess the relative difference of the maternal and child welfare services of the two countries. In the U.S.A., at present, facilities for maternal care for those who cannot pay are provided for only to a very limited extent out of public funds. Probably a part of the greater improvement in that country is due to the success attending the efforts made by ante- and post-natal clinics to increase maternal efficiency. Efforts have also been made to raise the standard of medical care by postgraduate education in paediatrics and obstetrics for practising physicians; and in New York and some other cities minimal standards for maternity services are enforced as public health regulations. With regard to England and Wales, it appears to be doubtful whether full use has been made of existing child welfare clinics. Statistics in a suitable form are not available, but the reports of the local medical officers of health suggest that, although in some areas over 90% of the children born attended a clinic, the total attendance per birth per year was low—of the order of 10. A fair inference is that the majority of mothers failed to take their baby more than once or twice to the clinic. The relative importance of the factors influencing infant mortality has not been established, since most conditions which have a close correlation with infant mortality have also a high degree of association with each other. Within the country there is a considerable negative correlation between infant mortality and economic and environmental

conditions, although a comparison of regions reveals anomalies. The infant mortality rates by social class for four contrasting regions are:

Infant Mortality Rates, England and Wales, 1930-2

Social Class	Wales I	North I	East	Remainder of S.E.
I	43.1	37.8	29.9	33.1
II	52.2	50.3	41.7	38.4
III	70.0	71.9	46.7	41.6
IV	73.0	86.8	55.9	46.8
V	77.4	100.6	61.5	54.0

Within each region there is a definite correlation between social class and infant mortality; but the differences between the regions cannot be accounted for by this explanation, since it is impossible that the environmental and economic conditions of Class II of Wales I and North I are below those of Class IV in the remainder of South-East. Geographical position is hardly likely to account for much of the difference, since very low rates have been recorded in northern countries—e.g., the infant mortality during 1935-9 was 40 in Norway and 43 in Sweden.

Specific Causes

The trend of the most important of the specific causes of death for the first and last periods of Table I is shown in Table III. With the exception of violence and diphtheria,

has remained unchanged at ages 1-2, when it was the second most important cause of death in both periods. At ages 2-3 measles has been displaced by tuberculosis and diphtheria from the second position, which it held in 1920-4, and, for males, by violence in 1935-8. Whooping-cough has declined by a similar ratio for both sexes, and the girls suffered proportionately the same disadvantage at the end of the period as at the beginning.

Tuberculosis.—The mortality from tuberculosis fell considerably during the 20 years, and the relative importance of this disease as a cause of death in childhood also fell. The percentage of all deaths assigned to tuberculosis for age groups 0-1, 1-4, 5-9, and 10-14 in 1920-4 was 1.85, 9.4, 15.2, and 25.4, and the corresponding percentages in 1935-8 were 1.06, 9.2, 9.0, and 14.6. Tuberculosis of the central nervous system was mainly responsible for the mortality at ages 1-4. In the United States the trend of childhood mortality from tuberculosis is different from that of England and Wales: instead of a continuous decline a minimum occurs at ages 5-9. The rates per 100,000 white children in the U.S.A. during 1920-4 for ages 1-4, 5-9, and 10-14 were 34, 12, and 15; and in 1935-8 they were 11, 4, and 5. The rates in both periods were below those for the corresponding group in England and Wales, and the rate of decline was greater. In the U.S.A. the mortality decreased by two-thirds during the period, which was about 10% more than the rate of decline in England and Wales.

TABLE III.—*Death Rates per 100,000: England and Wales*

Ages	Measles		Scarlet Fever		Whooping-cough		Diphtheria		Influenza		Tb. (all forms)		Bronchitis		Pneumonia		Diarrhoea and Enteritis		Violence	
	1920-4	1935-8	1920-4	1935-8	1920-4	1935-8	1920-4	1935-8	1920-4	1935-8	1920-4	1935-8	1920-4	1935-8	1920-4	1935-8	1920-4	1935-8	1920-4	1935-8
Males:																				
0-	144	69	6	2	250	125	24	15	88	40	161	65	667	215	1,189	973	953	592	101	122
1-	303	118	18	8	178	67	61	25	64	21	185	82	161	32	737	347	160	55	73	68
2-	122	41	22	9	63	23	63	43	32	9	111	54	44	10	249	108	35	13	63	49
3-	58	23	21	7	30	13	73	57	19	6	72	35	19	5	109	55	17	7	53	48
4-	41	18	18	9	17	7	72	67	11	4	55	26	10	4	65	34	10	5	43	45
5-9	11	6	10	4	3	2	39	46	7	3	40	18	4	2	29	16	4	2	35	35
10-14 ..	1	0.5	3	1	0.1	0.03	9	11	5	2	35	15	1	1	12	7	2	0.4	23	23
Females:																				
0-	120	57	4	3	275	146	18	10	61	31	124	54	510	163	894	731	684	418	88	101
1-	272	100	16	6	235	94	52	22	51	17	150	73	152	29	642	284	145	46	51	46
2-	115	44	21	8	96	32	64	44	29	9	96	45	45	9	232	102	32	12	42	33
3-	61	24	20	8	47	19	71	55	20	6	66	29	20	5	105	54	15	7	39	31
4-	36	16	20	7	23	10	74	65	11	4	55	28	12	3	63	34	10	5	29	26
5-9	12	6	11	4	5	2	47	51	7	3	41	17	4	2	27	15	5	2	17	17
10-14 ..	1	0.6	4	1	0.2	0.1	11	12	6	2	55	21	1	1	11	7	2	1	7	8

all causes show a considerable reduction in mortality at each age during the 20-year period.

Principal Communicable Diseases.—The death rate for diphtheria for all ages under 15 fell by 29%, owing to the large decrease in mortality among the pre-school population; at school ages the death rate increased slightly during the 20 years. The pre-school child is generally infected by its older brethren of school age, and the decrease in family density due to the declining birth rate is probably a significant factor in this age shift of mortality. In the U.S.A. a great improvement in mortality from diphtheria has been effected since immunization was introduced. During 1920-4 the mortality rates in the U.S.A. for ages 1-4, 5-9, and 10-14 were 86.9, 42.0, and 11.1—approximately at the same level as in England and Wales; by 1935-8 the rates had fallen to 18.6, 5.9, and 1.3. Thus in the last period American school-children had a mortality rate of one-eighth of that of English school-children. The relative smaller decrease at ages 1-4 in the United States was due to concentrating at first on the immunization of children of school age. Success has attended the campaign for immunization in England and Wales, although not yet on the scale achieved in the U.S.A. There were 1,092 deaths at ages 1-15 attributed to diphtheria in England and Wales during 1943, compared with an average of 2,837 during 1935-8.

A considerable improvement has occurred in the mortality from the other common infectious diseases of childhood. The death rate from scarlet fever has fallen to a very low level: only about 6 in every 1,000 deaths at ages under 15 were attributed to this cause in 1935-8. The rate of the decline in mortality from measles was slightly greater at ages 1-2 and 2-3 than at other ages, but the relative importance of this disease

Respiratory Diseases.—A large proportion of the deaths occurring in childhood are attributed to pneumonia. In 1935-8 about one-seventh of all infant deaths—or, excluding the diseases peculiar to infancy, about one-third of the deaths due to infectious and general diseases at ages under 1, and one-sixth of all deaths at ages 1-14—were assigned to this cause. The mortality from pneumonia in infancy declined by almost one-fifth during the period, while at ages over 1 the death rate was approximately halved. A further reduction in mortality can be anticipated in view of the recently introduced treatment by chemotherapy, although this treatment gives only a small proportion of successes at the extremes of life compared with that obtained at other ages.

During the first two years of life the greatest decrease in mortality among the causes of deaths in Table III was shown by bronchitis. The death rate decreased by two-thirds at ages 0-1 and by four-fifths at ages 1-2 during the 20 years. Despite the large reduction in infantile mortality the relative position of bronchitis remained unchanged: it was the third greatest cause of death in both periods.

Other Specific Causes.—Although the mortality from influenza is subject to large periodic fluctuations, during the years reviewed there has been an improvement of from one-third to one-half in the death rates during childhood. In both periods diarrhoea and enteritis formed the second most important cause of death during infancy, and accounted for one-tenth of all deaths at ages 0-1. The rate of decrease was less in the first year of life than in the later ages; at ages 0-1 it was only half of that at 1-2 and 2-3. The mortality from violence increased during the first year of life during the 20 years, a small decline occurred at each age from 1 to 3, and rates at

school age were the same in both periods. The relative importance of violence during childhood increased for boys but not for girls. Violent deaths at ages 5-9 and 10-14 formed 17.0 and 18.0% of all deaths among boys and 9.5 and 7.2% among girls.

Conclusion

This short survey shows that since 1920 there has been a large fall in mortality during childhood, in which practically every cause of death shared, but it is evident that there is room for considerable improvement. The mortality level of diphtheria and violence showed an unnecessary and persistent wastage of child life. Although the infant mortality rate was lower than that of the highly industrialized countries of Europe, it was higher than in several other countries. This fact and the regional social class mortality of England and Wales suggest that the pre-war rate for the whole country could be reduced, probably by one-half.

HAEMATOMETRA DUE TO CICATRICAL STENOSIS OF THE CERVIX AFTER LABOUR

BY

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Haematometra after a birth injury to the cervix is a rare event. The following is a record of such a case.

Case Report

Obstetric History.—The patient, aged 24, had been married for two years. During her only pregnancy she attended an antenatal clinic in London, but was transferred to an E.M.S. hospital in the country before her confinement. The hospital records reveal that she had a surgical induction for post-maturity when three weeks past the expected date of confinement. Foetal distress became evident when the os was almost fully dilated. Forceps were applied, but were not successful in effecting delivery. The head was then perforated and the extraction became relatively simple. She subsequently developed parametritis and was not fit for discharge for six weeks. Even then she felt weak and did not recover her previous good health. The date of the delivery was Sept. 11, 1943.

History of Complaint.—In November, 1943, she had an attack of pain lasting about three days. The pain was like that previously accompanying her menstrual periods, but there was no loss. She says that she reported to a welfare clinic but that nothing abnormal was found. Similar attacks occurred in December, January, and February. She was then "bombed-out" and moved to the Midlands. In March, 1944, after the usual four-weeks interval, she had another attack, the pain being more severe. She reported to a doctor, who gave her tablets to ease the pain, which again subsided after three days. A month later, on April 15, the pain came on once more. This time it was worse than ever and was accompanied by vomiting. On April 18 she reported to the casualty department on account of the severity of the pain. She was found to have a tender abdomino-pelvic swelling and was admitted to the gynaecological wards.

Diagram of conditions found

On admission the history of recurrent pain at intervals of one month was elicited. On inquiry it was found that her present pain was intermittent and was mainly in the lumbar region. When asked if it was like labour pains she said that it was, "but much worse."

Her general condition was fairly good, though it was evident that the pain was severe. On abdominal examination she was found to have a slightly tender, firm, oval swelling arising from the pelvis and extending almost to the umbilicus, slightly to the left of the middle line. Contractions were watched for, but no alterations in consistence were demonstrable. On examining vaginally no cervix could be found. The abdominal swelling was continuous with a soft bulging of the vault of the vagina. The left vault was drawn upwards and to the left. At its summit was a narrow depression, about a quarter of an inch deep, which would admit the point of a uterine sound. Running into this depression were two scars, each about an inch long; one ran transversely across the vault, the other vertically up the left vaginal wall. Various sizes of probe were used in an attempt to establish communication with the swelling, but without success. The condition is shown diagrammatically in the accompanying figure.

Operation.—On April 18 the abdomen was opened. The free edge of the omentum was found to be lightly adherent to the floor of the vesico-uterine pouch and, more densely, to the left ovary. The body of the uterus was uniformly enlarged to the size of a twelve-weeks pregnancy. The cervix was drawn out to a length of about 4 in., and distended to a diameter of about 1½ in. Each tube had become sealed off at the abdominal ostium and was slightly distended. Hysterectomy was begun, and the uterus, together with the left tube and ovary and the right tube, was separated from its lateral attachments. The cervix was very thin-walled and was distended to the same diameter as the vagina, and it was therefore difficult to identify the line of separation of the two. At this stage the haematometra leaked at its lower end, and several ounces of thin chocolate-coloured fluid escaped. This was mopped away, and for the first time traction was exerted on the uterus. It was then found that the thinned-out anterior wall of the cervix had been completely torn across transversely, and its lower part could not be identified. The posterior attachments of the cervix were next divided and the uterus was removed. The bed of the uterus was inspected, but no sign of any intercommunication with the vagina could be made out, even when a finger was inserted in that organ. After peritonizing the raw area the abdomen was closed.

Convalescence was uneventful. When the patient was examined six weeks after discharge from hospital the condition of the vagina was the same as before operation, except for the absence of the swelling. The depression indicating the position of the cervical canal was still drawn upwards and to the left, and fixed in that position.

Comments

Haematometra is most commonly due to a congenital deformity, and then develops when menstruation begins. Acquired haematometra may be due to a variety of causes, the commonest being neoplasm of the cervix. Carcinoma, fibroadenoma, adenomyosis, or operations for these conditions, have been reported. Herring (1939) has published a case in which haematometra followed radium treatment for benign haemorrhage. Schockaert (1938) records a case due to cervical ulcer in prolapse. Cicatrization following cauterization of the cervix is a recognized cause. Caustics, stem pessaries, and gonorrhoeal and diabetic vaginitis have also been cited.

In a series of 19 cases reported by Bernstein and Walter (1939) congenital causes were responsible for 11. Of the remaining nine cases only two could be ascribed to obstetric injuries, and in each there was a vesico-vaginal fistula. In one the haematometra was found at operation nine years after childbirth; in the other the condition was found three months after delivery, and was due to adhesions in the fornices.

In the present case it seems, from the history, that the operation was performed during the sixth menstruation into the closed uterine cavity. There had been regurgitation of menstrual fluid into the tubes, which at the time of operation were sealed at the abdominal ostia. The adhesions of the omentum to the floor of the vesico-uterine gutter suggest that there had been a spilling into the peritoneal cavity at some stage before the tubes had become sealed off.

Two interesting features are the complete obliteration of communication between the uterus and the vagina, and the distension and thinning of the cervix. It is possible that the cicatrization occurring after the parametritis had drawn the lower end of the cervix upwards and to the left, and that this had been followed by sacculcation of the cervix when the menstrual fluid filling this organ had been subjected to pressure by uterine contractions. The remaining part of the cervical canal might then have become subject to a "valve-action," with elongation and lateral compression, causing its virtual obliteration. That some such sacculcation was present is evident