SURVEY OF THE PHYSICAL CONDITION OF CHILDREN BETWEEN THE AGES OF THREE AND FIVE YEARS IN CARDIFF AND RHONDDA SCHOOLS

WITH SPECIAL REFERENCE TO THE FACTOR OF MALNUTRITION

BY

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This investigation was an attempt to examine school children in the Cardiff and Rhondda areas, under 5 years of age, with the idea of gauging their physical condition and of determining what effects (if any) malnutrition and life in a "distressed area" may have upon their health.

As no inquiry of this nature had been made in these areas it was felt that an investigation following the lines of that done by Spence¹ in the Newcastle-on-Tyne area would be of value. Spence examined two main groups of children between 1 and 5 years old, and termed them the "city children" and the "professional families class," using the latter as a control group. In the present inquiry groups have been taken from elementary schools in two different areas. The need for a control group was urgently felt, but in spite of every effort it was not found possible to secure for examination an adequate number of children between the ages of 3 and 5 years in Cardiff living under good conditions in the residential part of the city. The difficulty of obtaining such a control group is stressed, because I feel that with it the results would have been correspondingly more valuable.

It has, however, been possible to contrast the findings in Cardiff and the Rhondda. The two areas differ socially and geographically. Cardiff, in the main, is a cosmopolitan city with a varied industrial life, while the Rhondda is mainly confined to the coal industry, and because of its high unemployment rate comes under the official designation of a "distressed area." Geographically Cardiff is flat and enervating; the Rhondda is hilly, and above the level of the houses is open hillside with bracing air.

In Spence's inquiry the age group examined was 1 to 5 years, but in the present investigation the age group 3 to 5 years has been chosen for the following five reasons. (1) Convenience and accessibility for examination was a guiding factor. The schools were visited in conjunction with the school medical inspection for new entrants; no selection other than age was made of the children or of the school. (2) This age group is not under direct medical supervision—that is, the children no longer attend welfare clinics, and are not yet under the school medical service; most of them had not been seen prior to the time of examination. They correspond, therefore, to children who have just left the pre-school category. (3) The children being "new entrants," the effect of school milk and general school routine was at a minimum. (4) The nutritional diseases of infancy were no longer active, and such conditions as juvenile rheumatism had not become evident. (5) The fact that the children were attending school excluded those with active disease.

Scope of Survey

The main points of investigation were as follows. (a) History of past illnesses. This was obtained by questioning the parent in every case. (b) Family history. (c) General physical examination, including mouth, nasopharynx, heart, lungs, abdomen, skeleton, and skin. (d) Height and weight of each child. The last two measurements were taken by either the school medical officer or the school nurse, the height being recorded to the nearest half-inch, and the weight to the nearest half-pound. The children were weighed without shoes, in socks and underclothing only. (e) Assessment of general

physical condition. This was considered to be the most essential part of the investigation, and the following grouping was used—namely, "good," "fair," and "poor." Those classed as "good" would include the "excellent" and "normal" of the Board of Education memorandum,² the "fair" corresponding to the "slightly subnormal," and the "poor" to the "bad." It was not considered desirable, or indeed possible, to group the children more accurately than this. The grouping was done without knowledge of the height and weight of the child, and was made on general clinical grounds. The main points noted were muscle tone, posture, amount of subcutaneous fat, anaemia, and mental alertness. Haemoglobin estimations or other tests were not used. (f) With the help of the sanitary inspectors each child's home was visited and inquiries made as to employment or otherwise of the parents, the total weekly income received from all sources, and the outgoings in rent and rates. Each house was inspected for overcrowding and vermin.

Evidence of "Malnutrition"

It will be noted that each child was examined for its general physical condition irrespective of any cause. The term "malnutrition" implies wrong feeding, and not of necessity underfeeding, as it has popularly come to mean. A lowered physical condition may be due to (a) underfeeding, (b) incorrect feeding, (c) unsuitable environment, (d) illness, (e) inability to assimilate food due to physical disorder, and (f) a mixture of causes. The first three of these may be termed *exogenous* causes, while (d) and (e) are *endogenous*.

Underfeeding and incorrect feeding are both of importance, but their assessment is manifestly difficult. The simplest available means of determining the possibility of underfeeding in such an inquiry as this is to note the money available in the family for the purchase of food; money, however, has widely different household values, and many mothers are extremely wasteful. The education of mothers in the art of spending is a much-needed requirement. The diet of such children is largely a carbohydrate one of bread and jam, a good mixed diet being none too common. Nevertheless direct evidence of incorrect feeding was scanty. Vitamin deficiency diseases were rare, and signs of old rickets at a minimum. A careful watch was kept for signs of vitamin A deficiency as described by Helen Mackay,³ but no example of this was seen.

We have no better means of measuring a child's general condition than by a clinical estimate. Height and weight are the best indices we have, but they must always remain secondary to clinical judgement. If, then, the decision lies on clinical observation in which of the groups "good," "fair," or "poor" to place a child, this must, and does, vary with each individual observer. Each may have slightly varying standards, and there is a danger in these being coloured by individual political and social views, or by the sight of a badly clothed, dirty child, or the graphic tales of the parent or school teacher. The writer, whilst fully conscious of these difficulties, has endeavoured to examine each child free from prejudice. The majority of figures published on this question are a collection of results obtained by a variety of observers, and as this inquiry has been conducted by a single individual the factor referred to above should be minimal.

Detailed Examination of Findings

The material comprised 208 Cardiff children and 278 Rhondda children. Fourteen schools were visited in each area. Using the classification described above, the following results were obtained from the general physical examination.

	No.	Per cent.		No.	Per cent.
Cardiff:			Rhondda:		
Good ...	173	83.2	Good ...	255	91.7
Fair ...	33	15.9	Fair ...	23	8.3
Poor ...	2	0.9	Poor ...	0	0.0

In each area an analysis has been made and a comparison attempted between those children classed as "good" (hereafter termed Group A) and those classed as "fair" or "poor" (hereafter termed Group B). The idea has been to determine which factors are of importance, especially in relation to Group B. The general result may therefore be tabulated thus:

	No.	Per cent.		No.	Per cent.
Cardiff:			Rhondda:		
Group A	173	83.2	Group A	255	91.7
Group B	35	16.8	Group B	23	8.3

A more detailed examination under twelve headings is given below.

1. SCHOOL ATTENDANCE

The average length of attendance in school prior to the examination was: Cardiff, five months; Rhondda, six months. The short length of attendance is important, because it signifies the minimal effect of school regime on the children.

2. WEIGHT AND HEIGHT

Spence's figures for the normal limits of weight and height have been used. These were compiled to include most of the normal weight and height lines in common use, and the zone of normality is considered wide enough to be used irrespective of sex. The figures are shown in tabular form below.

WEIGHT

	Total		Group A		Group B	
	No.	Per cent.	No.	Per cent.	No.	Per cent.
Cardiff:						
Above normal ...	63	30.3	60	34.7	3	8.6
Within normal ...	84	40.4	77	44.5	7	20.0
Below normal ...	61	29.3	36	20.8	25	71.4
Rhondda:						
Above normal ...	45	16.2	45	17.7	0	0.0
Within normal ...	113	40.6	113	44.3	0	0.0
Below normal ...	120	43.2	97	38.0	23	100.0

HEIGHT

	Total		Group A		Group B	
	No.	Per cent.	No.	Per cent.	No.	Per cent.
Cardiff:						
Above normal ...	8	3.8	8	4.6	0	0.0
Within normal ...	137	65.9	123	71.1	14	40.0
Below normal ...	63	30.3	42	24.3	21	60.0
Rhondda:						
Above normal ...	7	2.5	7	2.7	0	0.0
Within normal ...	189	68.0	186	73.0	3	13.0
Below normal ...	82	29.5	62	24.3	20	87.0

These figures are of great interest. That as many as 43.2 per cent. of the Rhondda children are below normal weight suggests at once that underfeeding of these children in a "distressed area" may have some bearing on this, and at first sight these findings appear to contradict the low number of children found in Group B—namely, 8.3 per cent. On the other hand, of the children in Group B 100 per cent. were below normal weight. If a lowered weight is taken as a criterion of "malnutrition," then one would expect the height of these children to be lowered also. Approximately 30 per cent. are below normal height in both areas, but whereas there is a big difference in the weight figures between Cardiff and the Rhondda, the height figures are approximately the same.

The reason for these findings is not altogether apparent. The normal zones used are wide enough to include

figures for both sexes, and in any case the proportion of male to female in this series is practically equal, there being only a slight preponderance of girls, whose average weight is a little less than that for boys at this age. In this connexion note may be made in passing of the effect of pre-natal deprivation on the weight in childhood observed by Wolff in Berlin.⁴ From the nature of this investigation no data are available as to the state of nutrition of mothers in the Rhondda three to six years ago. Reference to school medical officers' reports during past years shows quite definitely a lower weight average in the Rhondda children between 3 and 5 years old than in the Cardiff children, the heights being approximately equal. These findings, then, although at first sight paradoxical, are in keeping with past findings, and illustrate the error which may occur if the weight alone is used as a criterion of "malnutrition." The results are shown graphically on page 1258.

3. INCIDENCE OF INFECTIOUS DISEASES

	Totals		Group A		Group B	
	No.	Per cent.	No.	Per cent.	No.	Per cent.
Cardiff:						
Measles ...	126	60.6	103	59.3	23	65.7
Whooping-cough ...	92	44.2	74	42.9	18	54.1
Chicken-pox ...	55	26.5	47	27.2	8	22.9
Scarlet fever ...	21	10.1	19	10.9	2	5.7
Mumps ...	14	6.7	12	6.9	2	5.7
Diphtheria ...	4	1.9	3	1.7	1	2.8
Rhondda:						
Measles ...	122	47.1	116	45.5	6	26.1
Whooping-cough ...	75	27.8	69	27.1	6	26.1
Chicken-pox ...	40	14.4	36	14.1	4	17.4
Scarlet fever ...	29	10.4	27	10.6	2	8.7
Mumps ...	25	8.9	25	9.8	0	0.0
Diphtheria ...	5	0.2	4	1.6	1	4.3

Two main results are derived from a consideration of these figures: (1) that the incidence of infectious diseases is, on the whole, higher in Cardiff than in the Rhondda; (2) that measles and whooping-cough head the list in both areas. These two conditions are noted for their deleterious effect on the health of a child, and the greater incidence in Group B in the Cardiff area would appear to be evidence of this. The Rhondda figures, however, show the exact opposite, with a higher incidence in Group A. I have no adequate explanation to offer for these findings.

4. INCIDENCE OF RESPIRATORY DISEASES

	Totals		Group A		Group B	
	No.	Per cent.	No.	Per cent.	No.	Per cent.
Cardiff:						
Bronchitis ...	47	22.6	38	21.9	9	25.7
Pneumonia ...	25	12.0	17	9.8	8	22.9
Rhondda:						
Bronchitis ...	65	23.4	60	23.9	5	21.7
Pneumonia ...	39	13.8	34	13.3	5	21.7

The evidence of these infections was taken from the mothers' statements. The reliability of the history of bronchitis may be challenged, but the history of pneumonia is probably accurate. It will be noted that the incidence of pneumonia is considerably greater in Group B in both areas.

CARDIFF SCHOOLS

Group A (marked •): Above normal, 8 = 4.6 per cent. ; within normal, 123 = 71.1 per cent. ; below normal, 42 = 24.3 per cent.

Group B (marked X): Above normal, 0 = 0 per cent. ; within normal, 14 = 40 per cent. ; below normal, 21 = 60 per cent.

RHONDDA SCHOOLS

Group A (marked •): Above normal, 7 = 2.7 per cent. ; within normal, 186 = 73 per cent. ; below normal, 62 = 24.3 per cent.

Group B (marked X): Above normal, 0 = 0 per cent. ; within normal, 3 = 13 per cent. ; below normal, 20 = 87 per cent.

Group A (marked •): Above normal, 60 = 34.7 per cent. ; within normal, 77 = 44.5 per cent. ; below normal, 36 = 20.8 per cent.

Group B (marked X): Above normal, 3 = 8.6 per cent. ; within normal, 7 = 20 per cent. ; below normal, 25 = 71.4 per cent.

Group A (marked •): Above normal, 45 = 17.7 per cent. ; within normal, 113 = 44.3 per cent. ; below normal, 97 = 38 per cent.

Group B (marked X): Above normal, 0 = 0 per cent. ; within normal, 0 = 0 per cent. ; below normal, 23 = 100 per cent.

5. INCIDENCE OF OTHER INFECTIVE DISEASES

	Totals		Group A		Group B	
	No.	Per cent.	No.	Per cent.	No.	Per cent.
Cardiff:						
Ear discharge	26	12.5	18	10.4	8	22.9
Sore throat	21	10.1	16	9.3	5	14.3
Skin infections	17	8.2	16	9.3	1	2.8
Rhondda:						
Ear discharge	33	13.7	32	12.6	6	26.1
Sore throat	32	11.6	27	10.6	5	21.7
Skin infections	35	12.6	33	13.0	2	8.7

These figures were obtained from the mothers' statements. The greater prevalence of running ears and sore throats in the Group B children is to be noted.

6. HISTORY OF FEEDING DURING INFANCY (139 INQUIRIES)

	Totals		Group A		Group B	
	No.	Per cent.	No.	Per cent.	No.	Per cent.
Cardiff:						
Breast	65	46.7	55	48.3	10	41.7
Part breast	23	16.5	19	16.5	4	16.7
Artificial	51	36.8	41	35.2	10	41.7
Rhondda:						
Breast	140	50.4	130	50.9	10	43.5
Part breast	43	15.5	37	14.5	6	26.1
Artificial	95	34.1	88	34.5	7	30.5

It is noteworthy that only about 50 per cent. of the mothers were able to feed their child for the full time. Those who were able to feed for three months were graded as "part breast." That as many as one-third of the mothers pay money for artificial foods, even though it can be obtained cheap at clinics, is evidence of lack of proper education in this very important matter. The effect of breast-feeding is not directly manifest at the age under consideration, as the above figures suggest. It is well known that premature babies and marasmic infants seldom show clinical evidence after the age of 3. This particular inquiry does not bear direct relationship to the main issue, but has been included as part of a general dietetic survey.

7. CONDITION OF TEETH

	Totals		Group A		Group B	
	No.	Per cent.	No.	Per cent.	No.	Per cent.
Cardiff:						
Good... ..	91	43.8	79	45.7	12	34.3
Fair	70	33.7	57	32.9	13	37.2
Poor	47	22.5	37	21.4	10	28.5
Rhondda:						
Good... ..	140	50.4	130	50.9	10	43.5
Fair	68	24.5	63	24.7	5	21.7
Poor	70	25.1	62	24.3	8	34.8

The teeth were marked as "good" in the absence of caries, "fair" where three or less teeth were carious, and "poor" when more than three teeth were carious or infected. The general standard of the teeth of these children was poor, and over 50 per cent. were in need of dental treatment.

8. CONDITION OF NASOPHARYNX

	Totals		Group A		Group B	
	No.	Per cent.	No.	Per cent.	No.	Per cent.
Cardiff:						
Tonsils enlarged or unhealthy	92	44.2	75	43.4	17	48.6
Enlarged glands	145	69.7	119	68.8	25	74.3
Rhondda:						
Tonsils enlarged or unhealthy	177	38.5	93	36.5	14	60.9
Enlarged glands	171	61.5	151	59.2	20	87.0

The effect of tonsillar and, still more important, adenoidal infection on the health of a child under 5 is of great moment. The higher incidence of this in both areas in Group B is significant. The frequency of enlarged glands of the neck is a matter of note, and that the teeth are responsible for a large proportion is certain.

9. ECONOMIC ANALYSIS

	Totals		Group A		Group B	
	No.	Per cent.	No.	Per cent.	No.	Per cent.
Cardiff:						
Employed	130	62.5	111	64.2	19	54.3
Unemployed	50	24.0	41	23.7	9	25.7
Part employed	6	2.9	3	1.7	3	8.6
Father deceased or disabled	11	5.3	8	4.6	3	8.6
Not traced... ..	11	5.3	10	5.8	1	2.8
Rhondda:						
Employed	105	37.8	95	37.3	10	43.5
Unemployed	144	51.8	133	52.2	11	47.8
Part employed	7	2.5	7	2.7	0	0.0
Father deceased or disabled	16	5.7	14	5.6	2	8.7
Not traced... ..	6	2.2	6	2.4	0	0.0

The unemployment rate is definitely higher in the Rhondda, but in Group B there is little difference in that area, while in Cardiff a much larger proportion of Group B cases are from employed families.

10. AVERAGE MONEY PER PERSON PER WEEK (EXCLUSIVE OF RENT AND RATES)

	Totals	Group A	Group B
Cardiff:			
Employed	9/11	10/2	8/6½
Unemployed	4/8½	4/10	4/0
Part employed, father deceased or disabled	4/9	4/10	4/9
Rhondda:			
Employed	10/6	10/0	10/8
Unemployed	5/9½	5/9	5/11
Part employed, father deceased or disabled	6/4	6/5	5/4½

As previously stated, the home of each child was visited by the sanitary inspector, and details taken as to the economic and housing conditions. From the figures thus obtained an attempt has been made to determine the money available to purchase food and clothing, by deducting from the total money received in wages, subtenants, unemployment pay, etc., the amount paid out in rent and rates. This sum was then divided by the number in the family to give a comparative index. No adjustment was made for age distribution. The striking finding here is that in the area with the higher unemployment rate the moneys available for food and clothing are higher.

11. HELP IN KIND—MILK

There was very little evidence of help in kind, except for clothing, and it was not found possible to include this in any exact form. On the other hand, the question of extra milk through the schools and clinics is of paramount importance. It must be remembered that the majority of children under review had not been at school for any appreciable length of time, and the important period to consider in relation to extra milk is the time before entering school.

The arrangement in the Cardiff schools is that one-third of a pint of pasteurized milk daily is granted free of charge in necessitous cases, application being made by the parent. In other cases a charge of $\frac{1}{4}$ d. per one-third of a pint is made. No free milk is given at the welfare clinics after 1 year of age, and except by special order of the parish medical officer these children are unable to get extra milk. This means that between the ages of 1 and 3 years no special arrangement is available for these children.

In the Rhondda free milk, one pint per day, is provided at the school to children whose family incomes are below a specified scale, and those children attending a child welfare clinic may obtain their milk through the clinic, the latter being also governed by an income scale. From approximately October, 1932, to March, 1934, all children attending school were given two-thirds of a pint of milk irrespective of their financial circumstances, and this would cover some of the children under review. The milk supplied in the Rhondda is obtained from local vendors, is not of a specified grade, but has to conform to a recognized standard, and is examined for this from time to time.

It will be noted that during the whole of the pre-school time the Rhondda authorities grant free milk through their clinics, whereas in Cardiff this ceases after 1 year of age. Moreover, facilities are more readily available for the supply of milk in the Rhondda, and the amount granted is greater than in Cardiff.

12. HOUSING CONDITIONS

	Totals		Group A		Group B	
	No.	Per cent.	No.	Per cent.	No.	Per cent.
Cardiff:						
Overcrowding ...	14	6.7	10	5.7	4	11.4
House verminous ...	23	11.1	16	9.2	7	20.0
Rhondda:						
Overcrowding ...	14	6.0	11	4.3	3	13.5
House verminous ...	9	3.2	7	2.9	2	8.7

The housing conditions are noticeably worse in the case of the Group B children. It is to be noted that these figures were obtained by the sanitary inspectors in their corresponding areas, where their standards may differ slightly, but this does not vitiate the high Group B findings.

Analysis of Group B ("Fair" or "Poor") Children

An analysis of these cases may furnish a clearer idea as to the causes for their lowered health. Though the numbers are small, and a deduction therefrom may be open to criticism, nevertheless a close survey reveals certain interesting features.

The cases have been reviewed in the light of the classification described under the heading of "Evidence of Malnutrition," and divided into: (a) *endogenous* cases, in which there was clear medical evidence as a cause for their poor physique; (b) *economic* cases, where the housing and money conditions alone were abnormal; (c) *mixed* cases, showing both an endogenous and an economic factor; (d) *indeterminate* cases, where no definite cause could be assigned. Thus:

	Endogenous		Economic		Mixed		Indeterminate	
	No.	Per cent.	No.	Per cent.	No.	Per cent.	No.	Per cent.
Cardiff ...	10	41.7	7	20.0	4	15.7	14	40.0
Rhondda	7	30.5	3	13.0	2	8.7	11	47.8

If the endogenous group is withdrawn from these figures the remainder will include those cases in which "malnutrition," in its true sense, is a possibility. This may be expressed, as a proportion of the total number of children examined, as the *relative malnutrition rate*. The number of cases in which the economic factor is the only determinate cause, divided into the total number of children, gives the *basal malnutrition rate*. Thus:

	Total Children Examined	Relative Rate		Basal rate	
		No.	Per cent.	No.	Per cent.
Cardiff ...	208	25	12.0	7	3.4
Rhondda ...	278	16	5.8	3	1.1

Conclusions

A comparison between Groups A and B would seem to show that the most important predisposing causes to a lowered physical condition are the following: (a) infectious diseases, especially measles and whooping-cough; (b) respiratory diseases, especially pneumonia; (c) other infective diseases, especially otitis media and sore throat; (d) unhealthy nasopharynx; (e) unsatisfactory housing conditions.

It is surprising to note the little apparent influence of unemployment and income. This may to some extent be accounted for by the greater opportunities for the provision of free milk to children from homes in necessitous circumstances, and the larger amount of free milk given in the Rhondda area, as compared with Cardiff, may have a bearing on the difference found between the results in the two areas. It is, of course, impossible to segregate completely the multiple causes of "malnutrition." The above factors are of necessity all closely interrelated, and overcrowding as a possible source of the spread of infection is obvious. It is of importance to note, therefore, the higher percentage of overcrowding in the Group B cases.

The finding that the "relative" and "basal" malnutrition rate was lower in a "distressed area" is at once a stimulant to review the evidence of previous inquiries. It behoves us, therefore, to consider this question free from bias and in relation to the many factors at work, in a more critical manner than has been the custom hitherto.

Summary

The main conclusions reached as the result of this inquiry may be summarized as follows:

1. That true malnutrition is not common in the areas examined.
2. That there is no single cause of malnutrition.
3. That endogenous factors have a greater immediate effect on the health than exogenous factors.
4. That an unsatisfactory economic state probably tends to promote the occurrence of ill-health and to prevent adequate convalescent environment and nourishment.

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