EFFECT OF CERTAIN SOCIAL CONDITIONS ON THE HEALTH OF SCHOOL- CHILDREN

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The school-children from Salford included in the vitamin-feeding test in 1943-4, already reported (Bransby *et al.*, 1946), numbered 891. Data covering a wider field and involving a larger number of children were, however, obtained; these were found on examination to be of some interest, being concerned with the relationship between home, family, and economic conditions on the one hand and the rate of growth, certain medical and dental conditions, and school attendance on the other. Involved in this analysis were 2,945 children, 5 to 14 years old, attending 23 elementary schools in Salford, and 82 boys evacuated from Salford to Whiteacre camp school, in Lancashire. They were weighed, measured, and medically examined early in 1943 and again one year later. The weighings, measurings, and medical and dental examinations were carried out in the same way as for the vitamin-feeding test. In addition, information obtained from data collected in Stoke-on-Trent, where the vitamin-feeding test was also carried out, relating absence from school with certain social conditions, is also included. It was the intention to present as full a set of results for Stoke as for Salford, but unfortunately the bulk of the Stoke results were destroyed by accident in the wartime drive for salvage.

Social Conditions and Absence from School

The social matters inquired into were home and economic conditions—each of which was graded good, fair, or bad—the number of children in the family, and absence from school and the reasons for it. Classification of the home conditions was made by individual teachers who knew the children well. In Salford there are few schools with a mixed population of high and low income groups, so the grading into economic groups was a fairly easy matter for the teachers. A sample check of the gradings was made by experienced health visitors, and it was found that their independent judgment corresponded well in the main with that of the teachers.

Clinical and Dental Examinations

The clinical conditions recorded were those which might in some way be affected by the general state of nutrition or specific vitamin deficiencies. The examination consequently was not a complete medical examination covering every aspect of health. The clinical examination paid attention to: state of nutrition (good, fair, or poor), round shoulders, pot-belly, lordosis, winged scapula, knock-knees, bow-legs, scoliosis, deformed chest, physique, obesity, chest rales and cough, ear discharge, goitre, angular stomatitis, cheilosis, pityriasis sicca, pallor of mucous membrane, styes, blepharitis, simple conjunctivitis, phlyctenular conjunctivitis, circumcorneal infection, transverse ridging of nails, nails bitten, brittle nails, coarse and dry hair, impetigo, boils, chilblains, other sepsis, seborrhoea, follicular keratosis, and dryness of the skin. At each examination the conditions were graded 0, 1, 2, or 3, according to their presence and severity.

The dental conditions taken into account were: general tone of the gums and the presence of gingivitis, haemorrhage, tartar, mottling, and caries. The extent of mottling, haemorrhage, tartar, and caries was graded 0, 1, 2, and 3, and gingivitis 0, 1, 2, 3, and 4, in the manner of King, Francklyn, and Allen (1944). The general tone was graded "firm" or "flaccid." All the teeth present in the mouth were examined and graded individually for caries and mottling, and the average caries and mottling per tooth present were calculated. The

examination for general tone of the gums, gingivitis, haemorrhage, and tartar was limited to the regions $\frac{2}{2} \frac{1}{1} \frac{1}{1} \frac{2}{2}$, each of these teeth being examined and graded individually.

For the clinical conditions the data of the boys and girls were analysed together; for the dental conditions the data were analysed for boys and girls separately in the age ranges 5-7, 8-10, and 11-13 years.

The average incidence of the above clinical and dental conditions was calculated in children grouped according to the number of children in the families to which they belonged, home conditions, economic conditions, and nutritional grade. Two criteria were used to ascertain if the social circumstances and nutritional classification had any effect on the incidence of the clinical and dental conditions—the trend and consistency of the results, and formal tests of significance of the difference between the best and the worst groups of each of the three social classifications.

Results

To avoid the presentation of a large number of tables a statement of results is here given.

Clinical and Dental Conditions

The incidence of the following clinical and dental conditions increased with worsening social conditions; the figures in parentheses show the extent to which the incidence of the condition among children in bad home or economic conditions or belonging to large families exceeded the incidence among children in good home or economic conditions or belonging to small families. Ranges are given for the figures (in parentheses) because they relate to the three factors, home and economic conditions and number of children in the family, and also breakdowns, according to sex and age. The percentages for all these breakdowns fall, for each of the clinical conditions mentioned, within the ranges given: impetigo (40-60%), sepsis (56-276%), angular stomatitis (36-128%), pityriasis sicca (14-28%), coarse and dry hair (50-400%), dryness of the skin (20-64%), round shoulders (4-71%), deformed chest (37-156%), tartar (75-167%), gingivitis (6-287%), and general conditions of the gums (0-250%). The incidence of caries increased among boys (11-22%). The gradings of nutrition and physique also worsened with decline in social conditions. The incidence of transverse ridging of the nails, which was at one time suggested as a criterion of poor nutrition, decreased with worsening social conditions. For the other particulars there was no discernible variation with social conditions.

Growth

Table I shows the number of children in the various sex, age, and social groups. The heights and weights of children of corresponding ages in good economic conditions, good home conditions, and belonging to families with one or two children were practically the same, and conform to those given in Table II. In Table III, for boys and girls of the age groups 5-7 years, 8-10 years, and 11 and more years, are given the differences in height and weight between those in (1) good and bad home conditions, (2) good and bad economic conditions, and (3) belonging to families with one and two children and families with six or more children.

TABLE I.—Number of Children in Various Sex, Age, and Social Classes

Age (years):	Boys			Girls		
	5-7	8-10	11+	5-7	8-10	11+
Home conditions:						
Good	189	315	193	184	250	246
Fair	179	346	248	185	265	155
Poor	45	29	17	35	44	20
Economic conditions:						
Good	124	157	158	105	142	177
Fair	170	362	214	185	262	158
Poor	119	171	86	116	152	87
Children in family:						
1, 2	207	307	214	191	231	183
3, 4, 5	173	293	187	179	246	189
6 or more	33	90	57	35	78	52

The heights and weights of children in bad economic or home conditions or belonging to large families were consistently less than those of children in good home or economic conditions or belonging to small families. Thus children in good home conditions were 1.7-2.6 in. (4.32-6.60 cm.) taller and 2.0-9.3 lb. (0.91-4.22 kg.) heavier than children living in bad home conditions, children in good economic circumstances were 0.6-1.4 in. (1.52-3.55 cm.) taller

TABLE II.—*Approximate Height and Weight of Children with Good Home or Economic Conditions or Belonging to Small Families*

Age (years):	Boys			Girls		
	5-7	8-10	11+	5-7	8-10	11+
Height (in.) ..	45.4 (115.3)*	50.6 (128.4)	55.2 (140.2)	45.3 (115.0)	50.1 (127.2)	55.8 (141.7)
Weight (lb.) ..	46.9 (21.27)	59.0 (26.77)	74.8 (33.93)	45.7 (20.73)	57.2 (25.95)	76.3 (34.61)

* The figures in parentheses in Tables II-IV represent the metric equivalent—height in centimetres, weight in kilograms.

TABLE III.—*Effect of Social Conditions on Initial Height and Weight*

Age (years):	Boys			Girls		
	5-7	8-10	11+	5-7	8-10	11+
Height:						
H.C. good minus bad (in.) ..	2.5 (6.35)	1.7 (4.32)	2.6 (6.60)	2.3 (5.84)	1.7 (4.32)	2.3 (5.84)
E.C. good minus bad (in.) ..	0.9 (2.29)	0.6 (1.52)	0.9 (2.29)	1.1 (2.79)	0.8 (2.03)	1.4 (3.55)
No. of children: 1, 2 minus 6+	1.8 (4.57)	0.8 (2.03)	1.0 (2.54)	1.4 (3.55)	1.1 (2.79)	0.6 (1.52)
Weight:						
H.C. good minus bad (lb.) ..	3.8 (1.72)	3.8 (1.72)	9.0 (4.08)	3.4 (1.54)	2.0 (0.91)	9.3 (4.22)
E.C. good minus bad (lb.) ..	1.6 (0.72)	0.5 (0.23)	2.5 (1.12)	0.5 (0.23)	2.3 (1.04)	5.6 (2.54)
No. of children: 1, 2 minus 6+	3.6 (1.63)	2.0 (0.91)	6.6 (2.99)	1.3 (0.59)	2.4 (1.09)	2.0 (0.91)

H.C. = Home conditions. E.C. = Economic conditions.

and 0.5-5.6 lb. (0.23-2.54 kg.) heavier than those in poor economic circumstances, and children in small families were 0.6-1.8 in. (1.52-4.57 cm.) taller and 1.3-6.6 lb. (0.59-2.99 kg.) heavier than those belonging to large families.

TABLE IV.—*Effect of Social Conditions on Height and Weight During a Year*

Age (years):	Boys			Girls		
	5-7	8-10	11+	5-7	8-10	11+
Height increases:						
H.C. good minus bad (in.) ..	-0.21 (-0.53)	-0.01 (-0.025)	0.18 (0.46)	-0.21 (-0.53)	0.05 (0.125)	0.23 (0.58)
E.C. good minus bad (in.) ..	0.22 (0.56)	0.12 (0.30)	0.69 (1.75)	0.20 (0.51)	0.25 (0.64)	0.48 (1.22)
Weight increases:						
H.C. good minus bad (lb.) ..	0.47 (0.21)	-0.56 (-0.25)	2.95 (1.36)	0.97 (0.44)	0.60 (0.27)	4.33 (1.96)
E.C. good minus bad (lb.) ..	-0.13 (-0.06)	-0.70 (-0.32)	1.83 (0.83)	1.02 (0.46)	-0.82 (-0.37)	2.88 (1.31)

H.C. = Home conditions. E.C. = Economic conditions.

Table IV shows the annual height and weight increases of boys and girls aged 5-7 years, 8-10 years, and 11 or more years, grouped according to home conditions and economic conditions. In good economic conditions the growth of children was better in all six age groups by 0.12-0.69 in. (0.30-1.75 cm.) than that of children in bad economic conditions, but there was no consistent difference between weight increases, except for boys and girls of 11 years in good economic circumstances, whose increase was 1.83-2.88 lb. (0.83-1.31 kg.) better than for similar children in poor economic circumstances. On the other hand, the children living in good home conditions did not grow in height any better than those in poor home conditions, but the weight increase was better in five out of the six groups by 0.47-4.33 lb. (0.21-1.96 kg.).

TABLE VI.—*Absenteeism, Days per Child, due to Various Causes according to Sex and Age*

Age (years):	Stoke-on-Trent						Salford					
	5-7		8-10		11 or more		5-7		8-10		11 or more	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
Cause of absence:												
Respiratory ..	7.6	10.2	5.6	7.9	4.0	5.5	13.3	15.8	11.8	12.2	9.9	14.3
Skin ..	5.4	3.7	1.4	2.4	1.8	0.9	2.3	2.7	1.8	1.8	2.5	1.7
E.N.T. ..	2.4	4.6	1.2	1.4	1.8	2.6	2.6	4.5	2.7	3.7	2.7	4.1
Gastro-intestinal ..	0.7	0.7	0.7	1.3	1.3	1.8	2.5	2.9	2.5	2.6	2.5	3.2
Eyes ..	0.1	0.5	0.2	0	0	0.3	0	0.1	0.2	0.2	0.1	0.2
Infections ..	8.9	6.3	2.7	1.1	1.1	0.8	7.9	7.3	2.3	2.3	1.8	2.0
Unspecified ..	10.2	11.2	2.7	6.4	3.8	5.9	2.0	3.0	2.1	3.0	2.2	3.8
Injuries ..	1.2	0.5	1.2	1.3	0.9	0.7	2.7	1.8	1.5	1.4	1.6	1.3
No illness ..	4.4	5.7	7.2	2.9	6.7	4.3	11.3	12.1	11.5	12.1	14.0	14.2
Total ..	40.9	43.4	23.2	24.7	21.4	22.8	44.6	50.2	36.4	39.3	37.3	44.8

Absence from School

All practicable steps were taken to ensure that the reasons for absence from school were accurately recorded. Both in Stoke and in Salford the services of the health visitors or school nurses were used in checking the reasons given for absence. The absences were grouped into the various categories listed in Tables V and VI by collaborators in Stoke and Salford, and this may have caused some lack of uniformity and account in part for the differences found between the two areas. Consequently comparison between the results for these towns can only be made with caution.

Table V shows, for boys and girls living at home in Stoke and Salford, the number of days' absence from school for various causes and the percentage of the total absenteeism due to each cause, and Table VI shows the absenteeism of children grouped according to sex and age.

TABLE V.—*Absenteeism, Days per Child, due to Various Causes*

Cause of Absence	Stoke-on-Trent		Salford		Camp School
	Boys	Girls	Boys	Girls	
Number ..	510	410	1,561	1,384	
Respiratory ..	5.2 (21%)	7.4 (26%)	12.0 (30%)	13.9 (31%)	2.1
Skin ..	2.4 (9%)	2.1 (7%)	2.2 (6%)	2.0 (5%)	1.5
E.N.T. ..	1.7 (7%)	2.6 (9%)	2.6 (7%)	4.1 (9%)	2.5
Gastro-intestinal ..	1.1 (4%)	1.4 (5%)	2.5 (7%)	2.9 (7%)	1.4
Eyes ..	0 (0%)	0.2 (1%)	0.1 (0%)	0.2 (0%)	0
Infections ..	3.1 (12%)	2.2 (8%)	3.7 (9%)	3.7 (8%)	0.5
Unspecified ..	4.7 (18%)	7.3 (26%)	2.1 (5%)	3.2 (7%)	1.4
Injuries ..	1.1 (4%)	0.9 (3%)	2.0 (5%)	1.5 (3%)	0.4
No illness ..	6.4 (25%)	4.1 (15%)	12.2 (31%)	12.7 (30%)	13.8
Total ..	25.7	28.2	39.4	44.2	23.6

Table V reveals that in Salford respiratory conditions and causes other than illness each accounted for about 30% of the total absenteeism, the other 40% being due to the remaining seven causes. In Stoke, absenteeism due to respiratory conditions was 21-26%, and causes other than illness 15-25%. In Salford, absence due to unspecified illness amounted to 18-26% compared with 5-7%. This discrepancy may have been due to the grouping of the various illnesses into different categories in the two localities. Total absenteeism comprised about 12% of the possible school attendance in Stoke and 18% in Salford.

Sex and Age

Girls had somewhat more absenteeism—about 10% in Stoke and 15% in Salford—than did boys. The incidence both of respiratory and of E.N.T. conditions was consistently greater for girls than for boys.

Absenteeism was greater among young children than among older ones. Thus for children aged 5-7 years, compared with those aged 11 or more, absence was about 5 days (15%) greater in Salford and about 20 days (90%) greater in Stoke. Absence due to infectious disease was considerably greater among young than among older children, and the younger had a somewhat higher incidence of respiratory complaints. In Stoke the incidence of unspecified illness was also much greater among young than among older children. Older children in Salford were somewhat more often absent owing to causes other than illness—about 35%, compared with about 25% of total absence for younger children—but the difference was not so marked for Stoke.

Social and Economic Conditions

In Salford the number of children in the families had no effect on absenteeism, but among children with bad home conditions absenteeism was 30 to 40% greater than among those with good home conditions, owing to some extent to a greater incidence of skin conditions, but mostly to absenteeism from causes other than

illness. Among children in good home conditions 25% of the total absenteeism was due to causes other than illness; among children in poor home conditions the proportion was 36 to 41%.

Nutrition

Children graded as of poor nutrition in Salford had about 15% more total absenteeism and absenteeism due to illness than had children of good nutrition, while in Stoke the differences between the children with good and those with poor nutrition was 30 to 40%. Absenteeism among boys living in Whiteacre camp school was considerably less than that of boys living at home at Salford—total absenteeism being 23.6 days, compared with about 37 days—and that due to illness 9.4 days, compared with about 24 days for boys aged 7-14 years in the two localities. The relatively high absenteeism through causes other than illness was due to the fact that the children lived in the camp school and occasionally visited relatives and friends. The difference in the sickness rate of the Salford children from that of the camp school children was due almost entirely to absence from respiratory conditions; this averaged about 12 days for the Salford boys and 2 days for the Whiteacre camp school boys.

Discussion

Analysis shows that there is a relationship between on the one hand social conditions as represented by home and economic conditions and the number of children in the family, and on the other hand the health of the Salford children as represented by the somewhat limited range of conditions noted at the clinical examination and by the growth data—the poorer the social conditions the worse the health levels. Yudkin (1944), in a study of the nutritional condition of children in Cambridge, found that children in a school in a fairly poor district, compared with those in a school in a comparatively well-to-do district, were on the average 0.8 in. (2.03 cm.) shorter, and 2.6 lb. (1.18 kg.) lighter, and had 2% less haemoglobin and a grip 1.25 kg. weaker. The absenteeism data suggest that social conditions did not affect absence from school due to illness, although with worsening home conditions there was a substantial increase in absence due to causes other than illness. It is important, however, to note (a) that absenteeism among children graded "poor nutrition" was considerably greater, both in Stoke and in Salford, than among those graded "good nutrition"; and (b) that there was a general lowering of the nutritional grading with worsening social conditions. Further, the average number of days' absence through illness among the camp school children was 9.4, compared with about 24 for boys living in Salford and about 14 for boys living in Stoke. It is also noteworthy that total absenteeism in Salford was about 65% greater than in Stoke, and that due to illness about 33% greater. The amount of absence due to illness, particularly respiratory conditions, appears to vary considerably from locality to locality, and the point arises as to how much of this is due to bad environment. It is not suggested that figures for the camp school children, extending as they do over one year only, represent the long-term morbidity rate of children living under such conditions, but the difference between them and the figures for Stoke and Salford at least suggests some association between morbidity of children and their living conditions.

Summary

Data of 2,945 children aged 5-14 years attending day schools in Salford, and of 82 children living in a residential camp school, were analysed to show the relation between home, family, and economic conditions on the one hand and rate of growth, state of health, and school attendance on the other. Information obtained from data collected in Stoke-on-Trent relating absence from school with certain social conditions is also included.

An increase in the number of children in the family and worsening home and economic conditions were associated with a reduced rate of growth and state of health. Absence from school was not related to family size, but increased with worsening home conditions and state of nutrition. There was greater absenteeism among young than among older children and among girls than boys.

Absence from school from all causes and from illness was greater in Salford than in Stoke-on-Trent, and absence in both localities was greater than that in the residential camp school, which suggests that environmental factors were at least in part responsible for absence from school and for child morbidity.

We wish to express our thanks to the parents of the children participating in the test and to the staffs of the Education and Health Departments of Stoke-on-Trent and Salford for collecting the experimental data. Thanks are also due to Mr. S. H. Quayle,

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THE EVALUATION OF BARRIER CREAMS

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The ability of barrier creams to prevent deleterious substances reaching the skin of operatives has been amply proved in practice, and it can be asserted that the so-called "invisible glove" produced when these preparations are properly applied has done much to limit the incidence of dermatitis. Much has been written and spoken about the principles which must be obeyed if a satisfactory barrier cream is to be arrived at. Some formulators have included substances with the idea of increasing the scope of these preparations, but sometimes these additions are based on premises which are either hypothetical or, at the best, ill-founded. Others have attempted to medicate them, but whether in doing so the product has an added value as a protective cream is quite another matter. Although it may be that in theory a universal elixir could be made, the experience of those whose job it is to produce an article of real worth leads to the sound belief that it is always better to keep the product as simple as possible and to concentrate on making one which is as perfect as it can be to fulfil the essential requirements.

Barrier creams are expected to form a barrier against deleterious substances. That is the essence. They are not supposed to be cure-alls for any local erythema. They must be easy to apply and they must leave a coherent film which is impervious to extraneous substances. But they must be comfortable in wear. They should not produce a feeling in the mind of the user that the part anointed is encased; the invisible glove should preferably be imperceptible. Neither should the film be tacky or greasy so that it can contaminate any article which has to be handled; it is very important that articles handled should not slip from the grasp. Naturally, too, the film must be flexible so that it does not crack or form fissures. A case can be made out for the inclusion of substances which can neutralize or render inert specific irritants, but although in some instances this is advisable, and indeed desirable, the efficiency of a film of barrier cream to do this cannot be other than of a low order. If it is remembered that a proper film is only about 10 to 20 μ in thickness it will quickly be appreciated that the amount of neutralizing agent per square centimetre of skin surface is very small. Such additions cannot, therefore, deal with more than traces of the irritant; they are really useful only when the irritant is highly toxic even when present in minute quantities. Finally, in view of the general reluctance of people to take prophylactic measures, the interest of the user has to be titillated, and this can be done in no small measure by making the cream pleasant in appearance and texture. A minute trace of an odiferous principle is a useful addition provided that it does not lead to the scenting or perfuming of the product which is to be handled.

Owing to the diversity of industrial processes and products it is not possible to make one cream which can give protection against everything. Neither is it a practical proposition to make individual creams for every specific hazard. The compromise is to classify the known deleterious substances into groups. Investigation suggests that four types of barrier cream are necessary, and the four classes of hazard are: (1) irritant dusts; (2) aqueous materials; (3) solvents and oils; (4) aqueous and oil-containing substances. Barrier creams which will give protection against the first class must produce a coherent film which adheres well to the skin and which will prevent the dust