

# THE PROBLEM OF GASTRO-ENTERITIS AND MALNUTRITION IN THE NON-EUROPEAN PRE-SCHOOL CHILD IN SOUTH AFRICA

ISOBEL ROBERTSON, B.A., M.B., CH.B., D.P.H., *Maternal and Child Welfare Officer, Cape Town City Health Department*  
 JOHN D. L. HANSEN, M.B., M.R.C.P., D.C.H., *Department of Child Health, University of Cape Town, and*  
 AILEEN MOODIE, A.R.S.H., A.M.I.A., *Medical Social Worker, CSIR Clinical Nutrition Research Unit, Department of Medicine, University of Cape Town*

Official figures from the South African Bureau of Census and Statistics<sup>1</sup> for individual causes of death in pre-school children indicate that the main cause of death in this age group is gastro-enteritis. The loss of life from this cause is of staggering proportions; it is estimated that more than 11,000 pre-school children die annually from gastro-enteritis in the urban centres alone. Although figures in this paper refer to urban populations a similar state of affairs exists in rural areas, for which statistics are not available.

The gastro-enteritis figures present a challenge of the first magnitude and urgency to the medical and health services of this country. In this paper we have endeavoured to present some detailed statistics of the problem of gastro-enteritis in South Africa, to analyse the causes and effects of the high incidence and mortality, and to emphasize the importance of malnutrition. Practical preventive and therapeutic measures that can be adopted at national and local level to reduce mortality and morbidity rates are set out.

## Statistics

Although statistics relating to gastro-enteritis and malnutrition in the country as a whole are incomplete, the total numbers of deaths occurring in urban areas are reported by the local authorities and, from these figures and those

published by the Union Health Department, some idea of the total problem can be formed<sup>2,3</sup> (Table I).

Deaths from gastro-enteritis constitute 2% of all European and 22% of all Coloured deaths.<sup>1</sup> Almost all these deaths occur under 5 years of age. The position in the Union as a whole is shown in Table II,<sup>1</sup> in which the deaths from gastro-

TABLE II. DEATH RATES FROM ALL CAUSES FOR VARIOUS AGES AND BY RACE, PERCENTAGE DUE TO GASTRO-ENTERITIS ALONE: UNION, 1956.<sup>1</sup>

Race	Deaths from all causes			Deaths from gastro-enteritis as % of deaths from all causes*		
	per 1,000 live births	per 1,000 population*				
	0-1 yr.	1-4 yrs.	5 yrs. & over	0-1 yr.	1-4 yrs.	5 yrs. & over
Eur.	31.4	1.5	8.9	10.3%	9.5%	0.5%
As.	66.6	8.5	6.2	22.3%	19.3%	1.3%
Col.	137.8	22.8	8.9	38.8%	46.3%	1.2%
Ban.†	‡	49.9	10.7	34.8%	34.7%	1.1%

\* In same age and racial group.

† Figures for Bantu deaths are compiled from certain selected Municipalities.

‡ Unknown because of incomplete birth registration.

Eur. = European; As. = Asiatic; Col. = Coloured; Ban. = Bantu.

enteritis are expressed as a percentage of the total deaths in the same age and racial group. Table III gives similar figures for the City of Cape Town.<sup>4</sup>

Death returns, from which these statistics are compiled, do not reflect the position regarding malnutrition, because only the primary cause of death is used for statistical purposes. Malnutrition, apart from kwashiorkor, is usually listed as a

TABLE I. DEATHS FROM GASTRO-ENTERITIS, UNION, 1957

					Deaths from gastro-enteritis
European	..	..	..	..	516*
Asiatic	..	..	..	..	286*
Coloured	..	..	..	..	4,750*
Bantu	..	..	..	..	5,742†
Total recorded	..	..	..	..	11,294

\* As recorded by Union Health Department.<sup>3</sup>

† As recorded by 14 local authorities.<sup>2</sup>

TABLE III. DEATH RATES FROM ALL CAUSES FOR CERTAIN AGES BY RACE AND PERCENTAGE DUE TO GASTRO-ENTERITIS ALONE: CAPE TOWN, 1958.<sup>4</sup>

Race	Deaths from all causes		Deaths from gastro-enteritis as % of deaths from all causes*	
	per 1,000 live births	per 1,000 population*	0-1 yr.	1-4 yrs.
	0-1 yr.	1-4 yrs.	0-1 yr.	1-4 yrs.
European	23.3	0.9	1.2%	5.9%
Coloured	85.69	10	35.4%	40.7%
Bantu	191.1†	—	56.1%	39.3%

\* In same age and racial group.  
 † Figures for Bantu must be taken with reserve due to incomplete registration of births.

contributory rather than primary cause of death. It is noteworthy, however, that malnutrition is given as a primary cause of death in Pretoria in 10.7% of non-European deaths between 1 and 5 years of age<sup>2</sup> and in Cape Town in 13% of Bantu deaths between 1 and 2 years.<sup>4</sup>

The total incidence of gastro-enteritis is not known; however, clinics and out-patient departments are inundated with cases of the disease in the summer months. At one hospital in the Cape Peninsula\* approximately 9,000 cases of gastro-enteritis were treated in the 6-month period November 1958 to April 1959. Of these, 1,185 needed resuscitation with parenteral fluids.<sup>5</sup>

The extent of the problem presented by mortality from gastro-enteritis is illustrated in Figs. 1-5, drawn from Cape Town statistics. These are probably representative of other centres in the Union.

Figs. 1, 3 and 4 illustrate the fact that gastro-enteritis as a cause of death in the whole population is second only to heart disease and overshadows all infectious diseases except tuberculosis, which is also related to malnutrition. Gastro-enteritis exceeds all other causes of death in non-Europeans in the first 5 years of life.

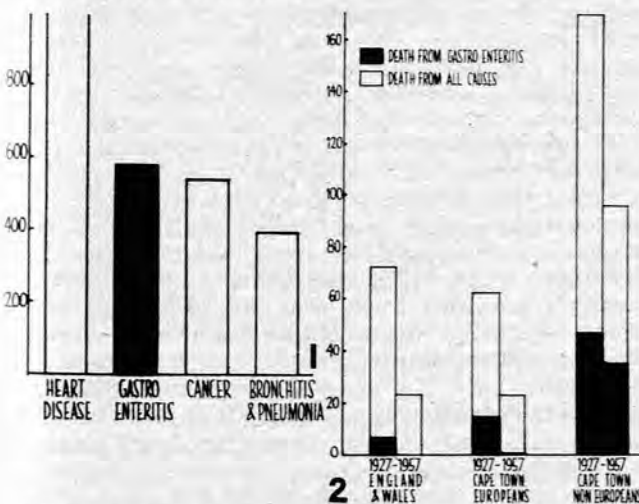


Fig. 1. Number of deaths, all races, from the four principal causes: Cape Town, 1957.<sup>2</sup>

Fig. 2. Reduction in infantile mortality rate (deaths under 1 year per 1,000 live births) in 30 years 1927-57, showing rates from all causes and from gastro-enteritis.<sup>2,6</sup>

\* See article by Dr. M. D. Bowie at page 344 of this issue.

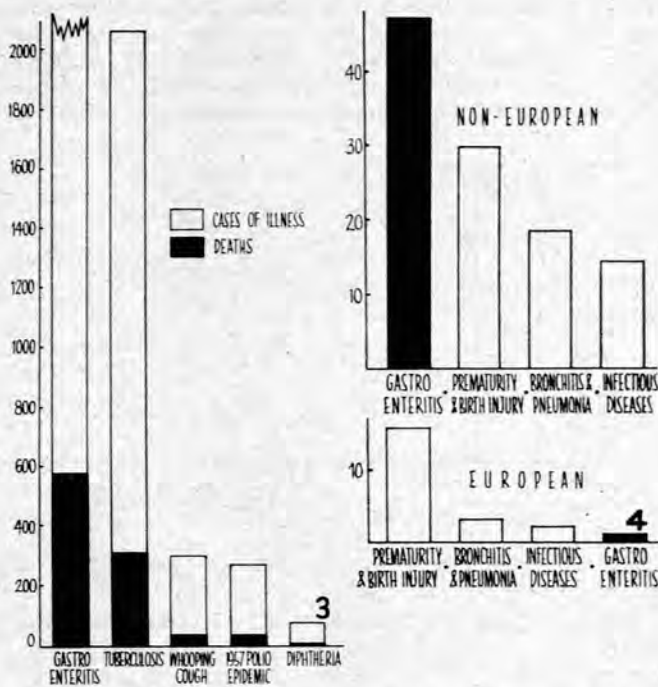


Fig. 3. Number of cases of illness notified and deaths certified from certain infectious diseases: Cape Town, compared with gastro-enteritis: Cape Town, 1957.<sup>2</sup>

Fig. 4. Deaths of children under 5 years from four main causes per 1,000 children born: Cape Town, 1957.<sup>2</sup>

The cumulative number of deaths from gastro-enteritis increases rapidly from 3 months to 2 years, after which age relatively few deaths from this cause occur (Fig. 5). Among non-Europeans these deaths have a markedly adverse effect on the general infantile mortality rate, while among Europeans so few deaths from gastro-enteritis occur that no such effect is seen.

The reduction in the rate of infantile mortality from all causes and from gastro-enteritis in the past 30 years for England and Wales<sup>6</sup> and Cape Town is shown in Fig. 2. Deaths from gastro-enteritis in England and Wales now number about 300 per annum. A similar reduction in infant deaths has occurred in the European population of Cape Town, but in non-Europeans it will be noted that while the infantile mortality rate has dropped appreciably the rate for gastro-enteritis has not dropped proportionately.

FACTORS UNDERLYING HIGH INCIDENCE

1. Infection

While there are many non-specific causes of diarrhoea there is little doubt regarding the importance of enteral infections in the aetiology of gastro-enteritis of infancy and childhood. In South Africa salmonella and shigella infections are common. During the summer months in one urban area the incidence of these infections amongst severe cases of gastro-enteritis was found to be as high as 37.5%.<sup>7</sup> It is quite possible that the actual incidence may be even higher than this. The role of specific *Escherichia coli* infection in the epidemiology of gastro-enteritis is as yet uncertain. These organisms were isolated from 41% of cases in one summer outbreak at Pretoria but were also found in 20% of non-diarrhoeal controls.<sup>8</sup> *Bacillus proteus* has also been

found to be present in a large number of cases,<sup>7</sup> but here again its causative role is uncertain. Evidence that virus infections cause outbreaks of gastro-enteritis is at least suggestive,<sup>9-11</sup> and these may be of considerable importance in this country. For example poliomyelitis and Coxsackie

virus and antibodies have been found in a high proportion of Bantu infants,<sup>12,13</sup> and it is not unlikely that similar evidence of high infection rates by viruses will be found when appropriate laboratory facilities become more generally available. Intestinal parasites, especially amoebae and *Giardia lamblia*, are frequently found to be responsible for sporadic cases.

Spread of enteral infection is closely related to standards of hygiene and sanitation. In many rural and peri-urban areas safe water supplies and proper sanitation are almost non-existent. The same may be said for fly control.

2. Malnutrition

Sixty years ago, in 1900, the Acting Medical Officer of Health for Cape Town, Dr. Averell Alston,<sup>14</sup> reported as follows: 'There is no doubt that the large death rate in regard to the three diseases just mentioned (diarrhoea, thrush and marasmus) is chiefly due to faulty artificial feeding, either by the use of contaminated cow's milk, or farinaceous and other indigestible foods, whereby the intestines are irritated and rendered more liable to septic influences. In regard to the latter, your Council have authorized the appointment of a female inspector, to visit the homes of newly-born children and to advise where necessary. It is essentially a matter of education among the poorer classes of the community, and only by patient perseverance in this respect can we overcome the reluctance of the mothers to discontinue feeding their infants on "anything that's going".'

The appointment of this lady inspector, whose main purpose was the education of mothers in the proper feeding of their infants and the prevention thereby of gastro-enteritis and marasmus, can be considered as the beginning of what today is the Child Welfare Branch of the City Health Department. This service has expanded over the intervening years, to become an integral and important part of the City's health services, with child welfare clinics scattered throughout the Peninsula and the health visitors from the clinics visiting the homes in their areas. The struggle to maintain infant nutrition and to correct malnutrition continues to be one of its major problems. Mothers attending the clinics are supplied with dried milk at cost price, or less where this is needed, and a reasonable standard of nutrition is thereby maintained even in the poorest areas. Although 29,000 individual infants and pre-school children attend the clinics each year, some of these attend only sporadically, and there are many other individuals who do not even take advantage of this service. Many reasons are responsible for this non-attendance, among which are the following: distance from the nearest clinic, economic circumstances which force the mother to go to work, and in many cases apathy or ignorance on her part. It is among the last group of irregular attenders and non-attenders that the worst cases of malnutrition and the greatest number of cases of severe gastro-enteritis are found. In an investigation of 250 deaths from gastro-enteritis<sup>15</sup>

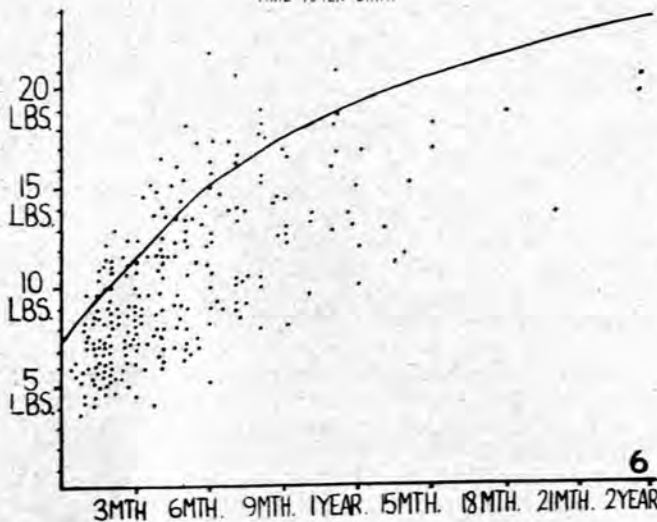
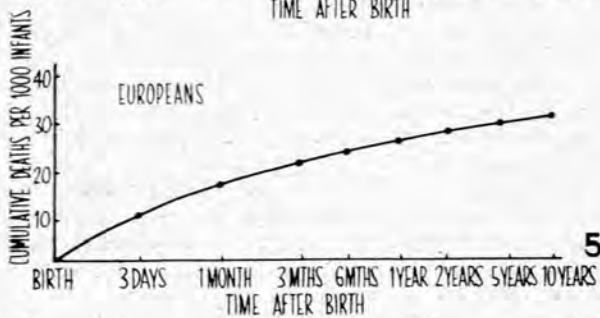
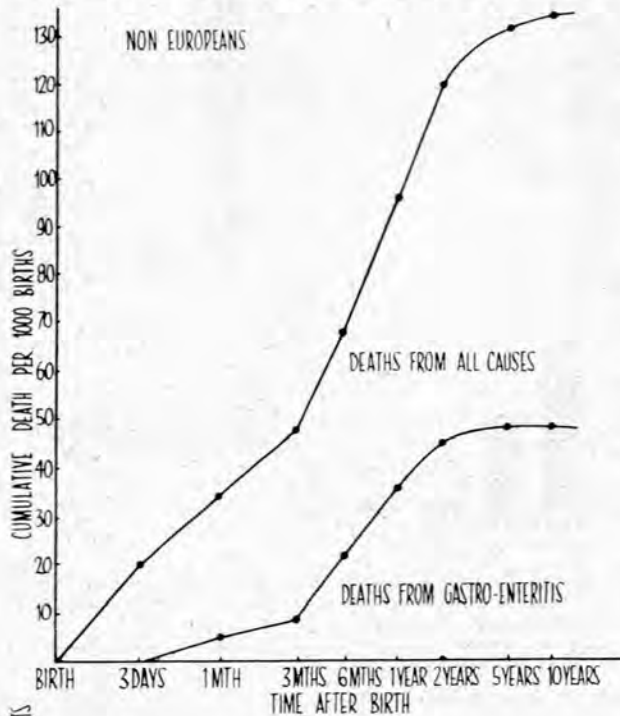


Fig. 5. Cumulative numbers of deaths from all causes and from gastro-enteritis alone, per 1,000 children born; Cape Town. This diagram shows the rapid rise in total deaths between 3 months and 2 years due to gastro-enteritis among non-European infants.<sup>2</sup>

Fig. 6. Weights of children who subsequently died of gastro-enteritis, recorded within a month of death but before the onset of diarrhoea, compared with the average weight of Coloured children. Cape Town.<sup>23</sup>



it was found that 54% of the children who died had never attended a child welfare clinic and 30% had only attended occasionally. In a current study of hospitalized cases of kwashiorkor it was found that 96% of the cases had either never attended a clinic or had done so only occasionally.<sup>16</sup>

In 1907 Finkelstein<sup>17</sup> pointed out the association of malnutrition and summer diarrhoea. In this country, Kahn<sup>7</sup> confirmed the liability of malnourished and marasmic children to develop diarrhoea. This has recently\* again been shown in the resuscitation room of the Red Cross War Memorial Children's Hospital at Cape Town.<sup>5</sup> The majority of the children needing resuscitation were malnourished, and the deaths occurred among the most malnourished individuals. In a series of 300 deaths in Cape Town in which the previous history was known, the weights of the children within a month of death but before the onset of diarrhoea are charted (Fig. 6). The chart demonstrates that the majority were severely malnourished before developing gastro-enteritis.

While accepting that malnutrition is the forerunner of gastro-enteritis in a high proportion of cases, one must recognize that gastro-enteritis in its turn increases the degree of malnutrition, particularly when milk is withheld for days or weeks after the onset of the attack. A vicious circle is thus established of progressive malnutrition and repeated attacks of gastro-enteritis, which may lead on to kwashiorkor or to a fatal outcome unless proper feeding and treatment are initiated. Two typical case histories (Figs. 7 and 8) are given to illustrate this.

Case 1 shows the downward progress of an infant who started with marasmus after failure of lactation, developed gastro-enteritis, became more marasmic, fell below its birth weight at the age of 9 weeks, and died from a second attack of gastro-enteritis.

Case 2 shows the history of an infant, who progressed normally for 3 months while breast fed, but after weaning failed to maintain his expected gain in weight. He developed gastro-enteritis at 9 months, which accentuated the degree of malnutrition. A second attack of gastro-enteritis ensued, during which he lost weight severely, and just after his first birthday developed kwashiorkor, which proved fatal.

#### MALNUTRITION IN THE INFANT POPULATION

No figures can be given for the incidence of malnutrition, but it is becoming increasingly apparent that it is high. A recent analysis of weights of all non-European out-patients attending the Red Cross War Memorial Children's Hospital, Cape Town, has shown that half the cases are under the expected weight for age. Of both in- and out-patients 16% are suffering from the grossest degree of both marasmus and kwashiorkor. A current study of a series of hospitalized cases of kwashiorkor

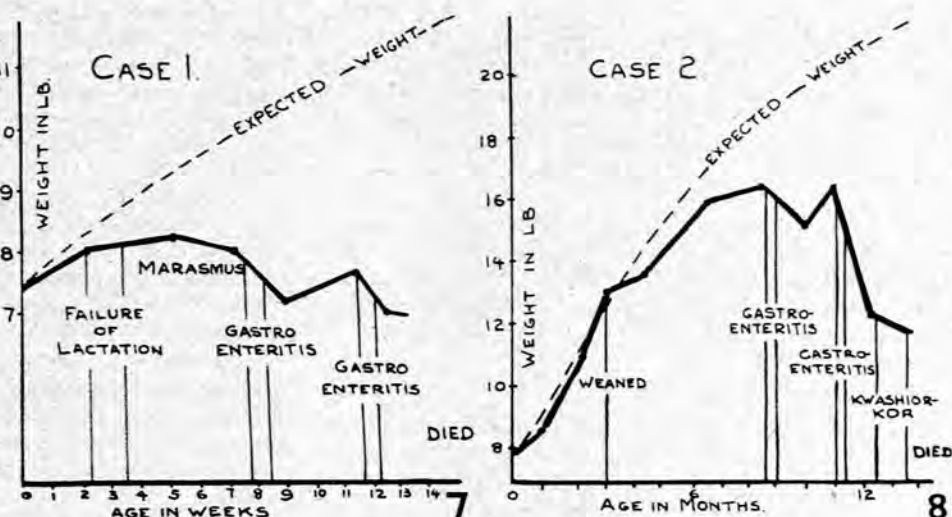


Fig. 7. Diagrammatic representation of case history of an infant who died of gastro-enteritis following marasmus.

Fig. 8. Diagrammatic representation of case history of a child who died of kwashiorkor following repeated attacks of gastro-enteritis.

and their siblings and near neighbours reveals the existence of a large child population at risk from kwashiorkor.<sup>16</sup> Some children in this population develop the full-blown syndrome; others reach a pre-kwashiorkor state or are saved by timely care or some fortuitous circumstance such as the father's re-employment; the majority survive a childhood of marginal malnutrition with poor growth as the most obvious stigma. The borderline between the sick and the well is a vague one, judging from medico-social data collected. In this susceptible group of children, those that develop the full syndrome of kwashiorkor are the ones subjected to cumulative stresses—environmental, physiological and emotional—which are too great for that individual to deal with at that time. Judging from reports from other parts of the country,<sup>18,19</sup> and from a recent historical review of kwashiorkor,<sup>20</sup> the existence of large child populations at risk is the rule in this country and in many other parts of the world. This population at risk lives on a defective diet from the early months of life. Indeed, one might say that the process starts in intra-uterine

TABLE IV. STILLBIRTH RATE AND INFANTILE MORTALITY RATE FROM IMMATURITY FOR RACIAL GROUPS: IN CAPE TOWN, 1958<sup>1</sup>

	Eur.	Col.	Afr.	As.
Stillbirth rate . . . . .	14.2	28.3	52.5	36.4
Infantile mortality rate from immaturity	6.53	16.26	21.15	13.24

Eur. = European; Col. = Coloured; Afr. = African; As. = Asiatic.

life,<sup>21</sup> if a high death rate from still-births and prematurity as seen in non-Europeans in Cape Town (Table IV) are indications of maternal malnutrition.

#### Discontinuance of Breast Feeding

In infancy one of the primary factors leading to malnutrition and gastro-enteritis in this socio-economic group is the short duration of breast feeding which the infants are afforded in many instances. In a series of normal non-European infants attending child welfare clinics, it was found that 88% were feeding at the breast at 3 months, whereas in the kwashiorkor series only 47% were still breast

\* See page 344 of this issue.

fed at this age. The reason for weaning in 61% of these cases was alleged or actual failure of lactation. Other factors were ignorance, mismanagement, and the mother's return to work. An investigation showed that in the whole Coloured population of Cape Town 39% of the mothers of young infants return to work soon after the infant's birth—17% in industry and 21% in part-time or full-time domestic service.

When artificial feeding is instituted, difficulties arise because of the expense of milk, and because many of the mothers have neither the knowledge nor the facilities to prepare the feeds hygienically and in the right quantities. Once breast feeding is discontinued the following factors are seen to promote malnutrition:

#### 1. *Lack of Hygiene*

This results in frequent infections, particularly of the respiratory and digestive systems, with consequent dietetic difficulties, which tend to produce a state of marasmus.

#### 2. *Incorrect Feeding*

While it is generally accepted by mothers that milk in some form should be given if breast feeding fails, the following practices are common and lead to a greater or lesser degree of malnutrition. They are dictated partly by the relatively high price of milk, and partly by custom and ignorance of food values:

(a) *Over-dilution of feeds.* From our experience and that of others in this country<sup>22</sup> this is a very important factor. The mother may mix 1-3 teaspoons of dried or condensed milk in a cup of water and feed the baby irregularly on this mixture.

(b) *Intermittent milk feeds with substitutes between-times.* The baby may be given 3 milk feeds in the 24 hours, or have milk for only 4 or 5 days in the week and then no more until pay-day. Sometimes the baby may go without milk for a week or longer because money is short. The following are amongst the substitutes commonly given in place of milk feeds: Bottles of plain or sugar water; strained oats, meelbol, Marie biscuits, custard powder, cornflour or other cereals mixed with water or very dilute condensed milk; weak tea, either black or with a little milk. Vegetable pulp, principally squash, is given early by spoon and also replaces milk feeds.

(c) *Protein-deficient toddler diet.* From 9 months onwards, milk ceases to be regarded as a necessary article of diet in many families, and the child continues on a diet consisting mainly of cereals and vegetables, especially the popular squash, together with tea or cool drinks. Meat is not given to young children because it is too 'strong'. Fish is the salvation of many, but is usually only available once or twice a week. An important factor in the toddler stage is lack of appetite resulting from various causes such as anaemia and dental caries. As the children grow older they are more demanding and better able to fend for themselves, and are given a more adult diet including meat. Perhaps that is why severe malnutrition and gastro-enteritis are less common after 3 years of age. There is no doubt, however, judging by growth curves,<sup>23,24</sup> that suboptimal nutrition persists throughout childhood.

#### 3. *Environmental and Social Factors*

(a) *Housing standard.* The death rate from gastro-enteritis varies markedly in different areas according to the degree of poverty and bad housing present. In two purely non-

European areas in Cape Town, namely Athlone and Windermere, this difference is clearly seen. In Athlone, where housing conditions are fairly satisfactory, with one-third of the population resident in municipal houses and many of the remainder reasonably well housed, the death rate from gastro-enteritis is half what it is in the Windermere area, where housing and environmental hygiene are of an extremely low standard. In a previous article<sup>15</sup> it was shown that only 9% of families where deaths from gastro-enteritis had taken place were decently housed. In Krige's study of the social background of malnutrition and gastro-enteritis at King Edward VIII Hospital in Durban<sup>18</sup> it was found that in the urban cases 93% came from shack areas and backyards.

(b) *Ignorance.* Lack of proper care resulting largely from ignorance must be indicted as an important causative factor. This includes the general ignorance of child care that prevails amongst the mothers themselves and among the busy neighbours and irresponsible young girls who are often left in charge of infants during the day. The harm that arises from foster care in early infancy is seen most markedly in infants whose mothers return to domestic service and place them with foster mothers. This is often done within the first month. The death rate among these foster-infants is found to be twice that among the Coloured infant population as a whole. There is also the ignorance that results from a poor standard of education among parents, which limits their ability to buy or budget wisely, to reject superstitious practices, and to discriminate between sound advice and plausible sales talk. Many workers, but notably Spence and his group,<sup>25</sup> have concluded that the determining factor in the well-being of the child is the capacity of the mother.

(c) *General social disorganization.* Following Krige's classification<sup>18</sup> this term covers a variety of factors that are repeatedly found to play a significant part in the background of malnourished children; viz. unemployment or casual employment of fathers, absence of mothers, illegitimacy, negligence, non-support, alcoholism, and disrupted home and family life. These are especially noticeable in urban areas where rapid industrial development, causing among other things a shift in population from country to town, is producing a demoralized and insecure society that has not yet succeeded in adapting itself to the pace of current change.

(d) *Poverty.* Underlying all the social causes outlined above is the fact that there is widespread poverty among the non-Europeans in the Union, and that a considerable section of the population do not earn enough to cover their basic needs. This is illustrated in Cape Town by the following figures. In 1955, Prof. Edward Batson conducted a housing survey of Cape Town from the findings of which it appeared that 5% of all Coloured households in the municipality had gross monthly incomes of less than £10, and 25% had gross monthly incomes of less than £20. The corresponding percentages among European households were 1 and 4 respectively.<sup>26</sup> In a current survey of 300 Coloured families in Cape Town in which deaths from gastro-enteritis had occurred, it was found that 80% had a total income of under £20 a month, and in 30% the wage earner was unemployed or in casual employment and earning less than £10 a month.

#### HOW CAN THE POSITION BE IMPROVED?

The following are means by which improvement can be effected in the present position:



### 1. Promotive Health Services

Child welfare services embracing efficient home visiting of infants and pre-school children, and infant welfare clinics, are extremely important in the maintenance of the nutrition and health of the pre-school child. This is a pressing need for extension of these services, to cover all infants and pre-school children. Through this medium the following health measures can be achieved:

(a) Promotion of breast feeding, which is the surest safeguard against malnutrition and gastro-enteritis in infancy. This can best be encouraged by sympathetic propaganda among mothers at pre- and post-natal clinics, combined with measures to ensure proper nutrition of the mothers. In order to obviate early weaning, mothers should be encouraged to keep their infants in their care and not to return to work and leave them in the care of incompetent persons. To this end it would be of great assistance if the period of maternity benefit for women employed in industry could be extended beyond the present limit of 8 weeks after the infant's birth, and if domestic servants were allowed to have their young infants with them when returning to work.

(b) The provision of subsidized milk supplies for bottle-fed babies as well as for expectant and nursing mothers. This provision is necessary on an extensive scale if infant nutrition is to be maintained at a reasonable level.

(c) The distribution of milk, either as liquid milk or dried skimmed milk of high quality, and other protein-containing foods such as pulses or wholemeal bread and peanut butter, to the large number of pre-school children who are at present suffering from deficiency of protein in their diet.

(d) Improvement in the supervision of children between the ages of 1 and 6 years. This service is very necessary, for on the whole this group receives the least attention from health officials, falling between baby clinics on the one hand, and school inspections on the other.

(e) Education of mothers in the principles of hygiene and nutrition. This can be done by home visits and talks by health visitors or health educators, and by posters, pamphlets, lecture-demonstrations and films.

(f) Teaching of family spacing, to reduce the sizes of families to reasonable numbers, so that the parents are better able to care for their children.

All this increase of clinic services will need greater subsidies from local and national authorities, particularly for the provision of milk and other food supplements. It may be pointed out that machinery exists in the Public Health Act No. 36 of 1919 to deal with this problem. Section 3 of the Act includes among the functions of the Department of Public Health 'the prevention . . . of . . . preventable diseases within the Union.' To this end the National Nutrition Council was established by the Public Health Amendment Act No. 14 of 1940. The function of this Council 'shall be to investigate and report . . . upon all matters relating . . . to the prevention of malnutrition in and the improvement of the diet of the inhabitants of the Union . . .'

### 2. Curative Services

At present some of the larger hospitals and dispensaries in the Union have special resuscitation rooms in their out-patient or casualty departments which are properly equipped for the administration of intravenous or subcutaneous fluids.<sup>27,28,5</sup> At these centres large numbers of children

suffering from gastro-enteritis are successfully treated as out-patients.

Equipment of this type of resuscitation should be extended to more hospitals and out-patient dispensaries near to affected population groups. The cost of running a service of this nature is relatively small when the number of lives saved is taken into consideration. All such departments should be orientated towards education of the mothers in nutrition. In this connection it is important that children with gastro-enteritis should be given milk feeds within 24 hours of commencing treatment. Many children become severely malnourished because milk is withheld for too long a period after an attack of gastro-enteritis.

*Convalescent care.* Follow-up care at home, and the provision of convalescent beds for young children, are both badly needed to ensure proper recovery and restoration of nutritional state after gastro-enteritis, marasmus, and kwashiorkor. Lack of such care frequently undoes the good achieved by hospital treatment and is responsible for much of the progressive malnutrition and repeated attacks of gastro-enteritis which so frequently occur. Closer co-ordination of curative services on the one hand and child welfare services on the other is essential. This is being effected with great success in the Cape Peninsula, where cases seen at Provincial hospitals are followed up by the staff of the local child welfare clinics. Added to this is the close liaison and consultation between the professional staff of the Cape Town municipal child welfare department and their *vis-à-vis* in the Provincial service.

### 3. Social Provisions

Improvements in the current wage structure of unskilled workers and the progressive abolition of poverty must undoubtedly reduce the incidence of malnutrition and gastro-enteritis. This has already been observed in Britain over the last 10 years, where improved social conditions have been reflected by a marked improvement in child health. In 1947 the infantile mortality rate per 1,000 live births from all causes was 41, and from gastro-enteritis alone 5.13, whereas in 1957 the infantile mortality rate from all causes had dropped to 23 and that from gastro-enteritis alone to 0.44. Before 1947 the rates had been fairly stationary for some years.<sup>6</sup>

Short of such fundamental changes in the country's economy, much can be done by provisions such as the following:

(a) *Assistance for children of working mothers.* More crèches are needed for the children of working mothers. These can be run by voluntary bodies, by local authorities, or as an adjunct to factories where women are employed.

(b) *Insistence on parental responsibility.* The Children's Act, at present in the course of being amended, should in its new form be so drafted as to deal more effectively with neglect and failure on the part of the father to supply proper maintenance, especially where much of the available money is squandered on alcohol.

(c) *Recruitment of public interest and support.* All employers of labour, whether domestic, manual or industrial, could educationally and materially assist in one way or another (as previously mentioned) by encouraging their workers to provide proper care for their children and thereby improve the general health of the rising generation.

#### 4. Non-personal Health Services

From the improving of housing, water supplies and sanitation, and the controlling of fly breeding, a reduction in the spread of the infectious forms of gastro-enteritis will result; but where malnutrition precedes or predisposes to gastro-enteritis the nutritional provisions outlined above must be applied so as to prevent what today is a preventable disease which is exacting an intolerable price in the loss of young lives.

#### SUMMARY

In this paper we have attempted to show in some detail the extent of the problem of gastro-enteritis in pre-school children and infants, particularly amongst the Coloured and Bantu. The relationship of malnutrition to gastro-enteritis has been shown. It is in the main the child that is already suffering from malnutrition who becomes a victim, and a vicious circle is frequently set up, worse malnutrition following each repeated attack of gastro-enteritis, leading finally to kwashiorkor or death. The social and nutritional factors responsible for this state of affairs are discussed, and the preventive, curative and social measures suggested whereby this preventable disease and its sequelae can be markedly reduced.

We wish to thank Dr. E. D. Cooper, Medical Officer of Health for Cape Town, and Prof. Findlay J. Ford, Professor of Child Health, University of Cape Town, for their assistance in the preparation of this paper, and for permission to publish certain information.

#### REFERENCES

1. S. Afr. Bureau of Census and Statistics, Report 1956. Pretoria: Government Printer.
2. M.O.H. Reports for Benoni, Bloemfontein, Cape Town, Durban, East London, East London Divisional Council, Grahamstown, Johannesburg, Kimberley Board of Health, Krugersdorp, Natal Local Health Commission, Port Elizabeth, Pretoria, Vereeniging.
3. Union Health Department Statistical Report 1957: Pretoria: Government Printer.
4. M.O.H. Report for Cape Town, 1958 (in press).
5. Bowie, M. D., (1960): S. Afr. Med. J., **34**, 344.
6. Registrar General's Reports for England and Wales, 1927 to 1957. London: H.M. Stationery Office.
7. Kahn, E. (1957): S. Afr. Med. J., **31**, 47.
8. Coetzee, J. N. and Pretorius, H. P. J. (1955): S. Afr. J. Lab. Clin. Med., **1**, 188.
9. Buddingh, G. J. and Dodd, K. (1944): J. Pediat., **25**, 105.
10. Hodes, H. L. (1956): Advanc. Pediat., **8**, 13.
11. Syverton, J. T. (1959): Pediatrics, **24**, 643.
12. Gear, J., Measroch, V., Bradley, J. and Faerver, G. I. (1951): S. Afr. Med. J., **25**, 297.
13. Measroch, V., Gear, J. and Faerver, G. I. (1951): *Ibid.*, **25**, 421.
14. M.O.H. Report for Cape Town, 1900.
15. Robertson, I. (1957): S. Afr. Med. J., **31**, 19.
16. Moodie, A. D.: In preparation.
17. Finkelstein, J. C. (1907): Kinderheilk., **65**, 1.
18. Krige, E. J. (1952): S. Afr. J. Sci. **49**, 221.
19. University of Natal (1959): Memorandum.
20. Serimshaw, N. S. and Béhar, M. (1959): Fed. Proc., **18**, no. 2 part 2, 84.
21. Wishik, S. M. (1959): *Ibid.*, **18** no. 2, part 2, 4.
22. Walker, A. R. P., Fletcher, D. C., Strydom, E. S. P. and Andersson, M. (1955): Brit. J. Nutr., **9**, 38.
23. Woodrow, E. P. and Robertson, I. (1950): S. Afr. Med. J., **24**, 761.
24. Lurie, G. M. and Ford, F. J. (1958): *Ibid.*, **32**, 1017.
25. Spence, J., Walton, W. S., Miller, F. J. W. and Court, S. D. M. (1954): *A Thousand Families in Newcastle-on-Tyne*, p. 168. Published for the Nuffield Foundation and the Nuffield Provincial Hospital Trust by Geoffrey Cumberlege. London, New York, Toronto: Oxford University Press.
26. Batson, E.: Personal communication.
27. Hansen, J. D. L. (1957): S. Afr. Med. J., **31**, 452.
28. Kahn, E. *et al.* (1958): Med. Proc., **4**, 253.
29. Truswell A. S. (1957): S. Afr. Med. J., **31**, 446.