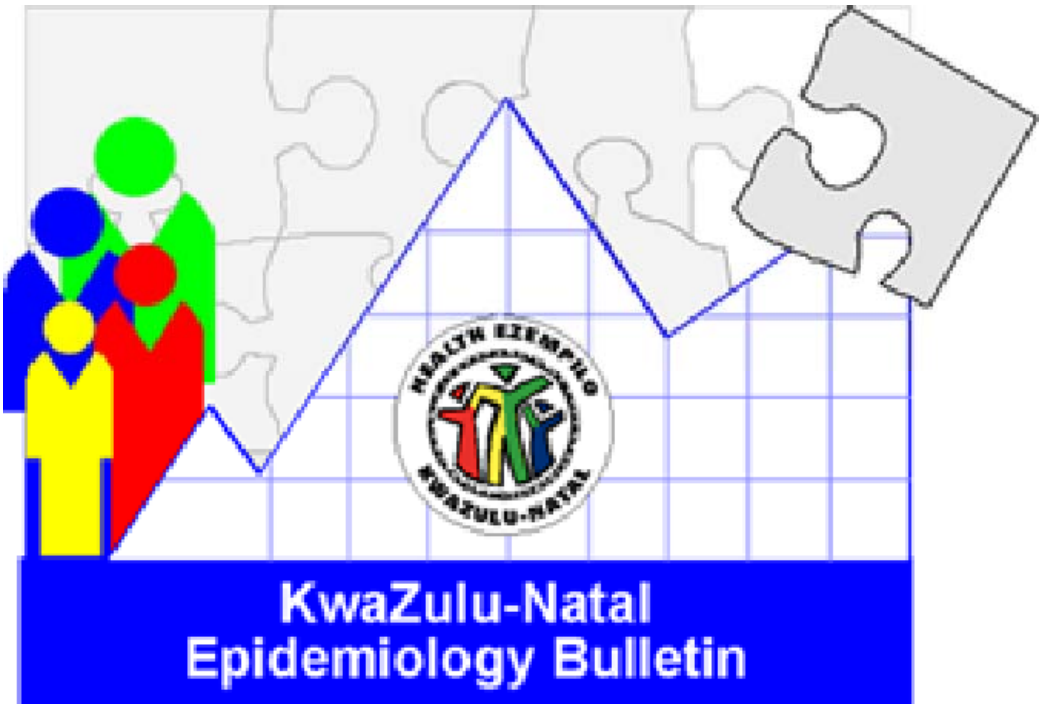

Issue 3

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Maternal, Perinatal and Nutritional Conditions in KwaZulu Natal

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Editorial

Studies in the latter half of the twentieth century have emphasized the central importance of adequate nutrition for human growth and achievement. Stunting has been shown to limit intellectual attainment, lack of micronutrients such as iron can result in iron deficiency anaemia and lack of iodine reduces cognitive development, insufficient vitamin A decreases immunity, and poor nutrition has additional long term effects on chronic disease patterns in later life. Nutrition therefore has a major influence on many aspects of human development. The important contribution of nutrition in achieving the Millenium Development Goals has been emphasized (ACC/SCN, 2003).

The South African National Food Consumption Survey of children 1- 9 years of age undertaken in 1999 found that over half the children were not adequately nourished; and that their diet provides insufficient energy and is of poor micronutrient quality. Approximately fifty percent of households experienced hunger, a quarter were at risk of hunger and only a quarter were food secure. To implement the essential improvements required to ensure that our children receive adequate nutrition, and that female children, the future mothers, are adequately nourished in order to reduce the proportion of low birth-weight babies, an inter-sectoral approach is essential. The role of the Health Sector is essential in order to raise awareness and to facilitate the links required at every level. Increasing the rate of exclusive breastfeeding will protect infants and reduce infant mortality. Improving vitamin A status can reduce under five mortality rates. The new policy of fortification of food staples with micronutrients will contribute to improved micronutrient intake. With the current rate of unemployment and epidemics of HIV/AIDS and TB, many families are unable to meet their nutritional needs, and an intersectoral response of service providers, NGOs and communities is urgently required.

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Acronyms & Definitions of Terms

AF	The population Attributable Fraction is the proportion of all cases (incidence or mortality) in a population, which can be ascribed to a factor. For mortality from a specific condition, it is summarized by the formula (Mp-Mu)/Mp, where Mp is the mortality from the specific condition in the total population and Mu is the mortality from the specific condition in the group not exposed to the causal factor. It is used to estimate the % reduction in incidence or mortality that would be obtained by eliminating the causal factor.
AR	The population Attributable Risk is the excess risk associated with a factor. It quantifies the net effect of a factor by estimating the absolute difference in incidence or mortality between the population group with the factor and the population group without the factor. In the case of mortality it is obtained by (Me-Mu), in which Me is the mortality among the exposed to the factor and Mu is the mortality among those not exposed. AR quantifies the net incidence or the net mortality that is contributed by specific causal factors that are more directly related to incidence or mortality. This helps to identify the interventions with more potential to produce an impact.
BMI	The Body Mass Index measures the nutritional status among adults. It is obtained by dividing the weight in kgs by the height in meters squared as follows: kgs/meters^2. A BMI under 18.5 defines undernutrition, a BMI between 25 and 29.9 defines overweight, while a value of 30+ defines obesity.
DHS	1998 Demographic and Health Survey.
DOH	Department of Health.
H/A	Height for age is derived by comparing the height of a child of a certain age with the height expected for that age according to the international anthropometric standard.
Hb	Haemoglobin is used to define the severity of anaemia according to defined cut off points (see main text).
KZN	KwaZulu Natal
Maternal death	Death of a woman while pregnant or within 42 days of the termination of pregnancy.

MMR The Maternal Mortality Ratio is expressed as number of maternal deaths per 100,000 live births.

NCCEMD National Committee on Confidential Enquiries into Maternal Death.

NFCS National Food Consumption Survey.

PMR The Perinatal Mortality Rate is defined in South Africa as =

$$\frac{\text{Stillbirths >=28 weeks (or >=1000 grams) + early neonatal deaths <=7 days}}{\text{stillbirths + live births}}$$

It is expressed as per 1000 births (including stillbirths). In other countries stillbirths are defined as >=20 weeks or >=500 grams.

SAVACG South Africa Vitamin A Consultative Group.

Still birth rate In South Africa it is defined as =

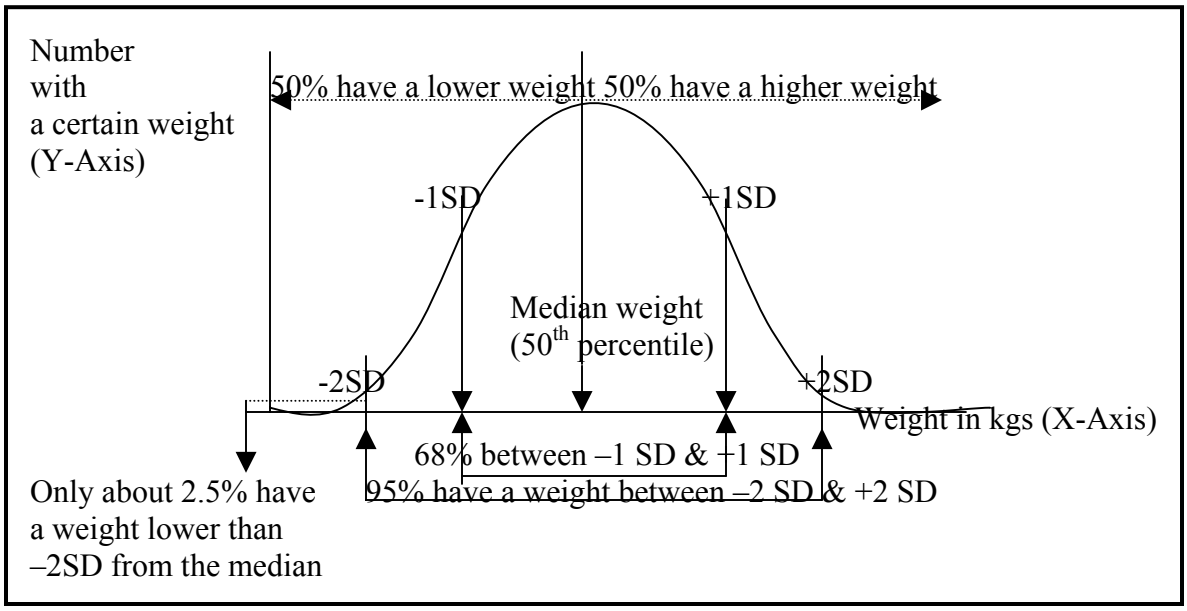
$$\frac{\text{Stillbirths >=28 weeks (or >=1000 grams)}}{\text{stillbirths + live births}}$$

It is expressed as per 1000 births.

Standard An anthropometric standard is used to provide a reference of normal anthropometric growth across ages. The National Center for Health Statistics (NCHS) is the most used anthropometric standard. It provides the anthropometric parameters for male and females for the different age groups between birth and 18 years of age. Although the NCHS is based on a representative sample of the US child population, it is used around the world because in a normal environment the growth of preschoolers is homogeneous across most populations. Instead the height of adult populations around the world varies because it depends on the adolescent growth spurt, which varies across populations.

SD The standard deviation is a measure of variation of a frequency distribution (i.e. height, weight). The weight distribution can be represented as a bell shape curve where the weight in kgs is on the X-axis and the number of children with each weight is on the Y-axis. The central tendency is the median weight (50th percentile) and the dispersion around the median is measured through standard deviations (SD). Around 68% of the measurements are between –1 SD and +1 SD, and around 95% are between –2 SD and +2 SD. Therefore the probability of a weight being below –2 SD is around (100% - 95%)/2 = 2.5%. Because the probability of such weight

being normal is very low, this cut off point is customarily selected to define abnormal nutrition.



Stunting — A child is stunted or short if his/her height is lower than –2 SD from the median height expected for that age. Stunting is a sign of chronic/long term malnutrition.

TOP — Termination of Pregnancy.

Underweight — A child is underweight if his/her weight is lower than –2 SD from the median weight expected for that age.

W/A — Weight for age is derived by comparing the weight of a child of a certain age with the weight expected for that age according to the international anthropometric standard.

Wasting — A child is wasted or thin if the weight is lower than –2SD of the median weight expected for that height. Wasting is a form of acute malnutrition.

W/H — Weight for height is derived by comparing the weight of a child of a certain height with the weight expected for that height according to the international anthropometric standard.

Abstract

This issue of the Bulletin deals with the conditions affecting the maternal and perinatal period and the nutritional status. The maternal mortality ratio for KwaZulu Natal (KZN) is expected to be 175-200 per 100,000 live births; and its most important direct causes include hypertension, haemorrhage, early pregnancy, embolism, sepsis and anesthesia. In more than half of the maternal deaths there are patient, administrative or health service related factors that contribute to mortality. These include non-attendance to antenatal services and delay in seeking help, lack of Termination of Pregnancy (TOP) services and delay in transport, poor diagnosis and clinical management, and ineffective resuscitation.

Perinatal mortality is in the order of 45-50 per 1000 births and its main obstetric causes include intrauterine death, antepartum haemorrage, intrapartum asphyxia; while the main neonatal causes of death include prematurity, asphyxia and trauma, infections and congenital abnormalities. Patient, health worker and administrative related factors affect more than one third of perinatal deaths.

KZN is affected by undernutrition and obesity. The 1999 food consumption survey found wasting to be less than 4% but stunting or chronic malnutrition affected one in five children between 1 and 6 years of age. The 1998 DHS found that about one in three adolescent males between 15 and 19 years of age was undernourished while one in three adult females 15 years and over was obese. Several studies found that micronutrient deficiencies, especially vitamin A deficiency, were frequent.

In terms of policy and planning options, there is still a need to identify more clearly direct and indirect causes, cost-effectiveness of priority interventions and feasible options to implement them. In the case of maternal and perinatal mortality, it is necessary to clarify better the chain of causation to avoid double counting and to estimate the attributable fraction of mortality associated with avoidable factors. In times of budget constraints, the extent to which causal factors are "avoidable" depends on their direct link to mortality, the fraction/proportion of mortality caused by these factors, the efficacy of interventions in reducing these factors, the feasibility and the costs to implement the interventions and the budget available. There is also a need to estimate the incremental costs involved in extending the coverage to an increasing proportion of the population, especially when the population is scattered in rural areas.

Although there are still sizable sections of the population with less access to food, there is also an overconsumption of carbohydrates and fats, and a low intake of fruits and vegetables. Nutrition fortification, micronutrient supplements and nutrition education are the priority interventions but also in this case there is a need to estimate cost-effectiveness, feasibility and coverage. Because it will take a while before changes in dietary habits take place, it is inevitable that the present levels of obesity will produce a high toll in morbidity and mortality from chronic degenerative diseases in the next coming years.

Maternal, Perinatal and Nutritional Conditions

Introduction

This issue of the Epidemiology Bulletin deals with the conditions affecting the maternal and perinatal period, and the nutritional status. As with issue number 2 that dealt with infectious diseases; scientific articles, reports and other documents were critically reviewed to assess methodological soundness and representativeness of the estimates.

Because of the limitations of published materials in providing updated estimates for the whole province, it has been necessary to apply a certain degree of assumptions; and to use statistics coming from other provinces and from the whole country. However imperfect epidemiological estimates may be, they are unlikely to be very far from the real ones, if epidemiological knowledge of diseases and a certain degree of error is taken into account, and if the estimates are checked for their consistency. As mentioned in the previous issue, the only way to improve these estimates is to increase the exchange of information between researchers and the Epidemiology Unit of the DOH.

This issue continues the "epidemiological dialogue" begun with issue number 2 and it is divided into the following sections: (a) maternal conditions; (b) perinatal conditions; and (c) nutritional conditions.

Maternal Conditions

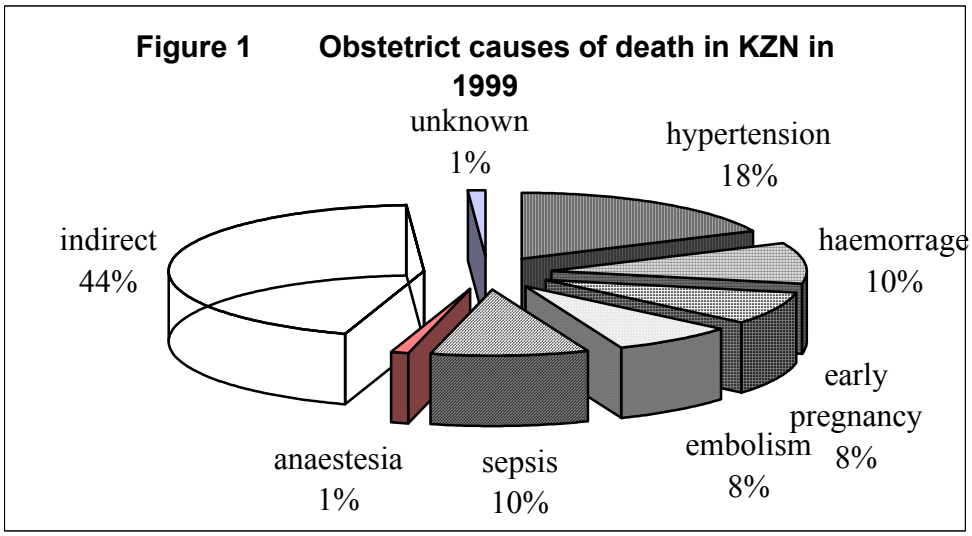
Maternal mortality ratio (MMR) in South Africa has increased in the last few years because of HIV/AIDS. MMR is defined as the number of maternal deaths[1] per 100,000 live births and its causes are divided into directly and indirectly related to pregnancy.
The 1998 DHS estimated for South Africa a MMR of 150 per 100,000 live births for the period 1992-98. The last report of the Confidential Enquiries into Maternal Deaths has suggested that in 1999-2001 MMR has increased to 175-200 per 100,000 live births because of HIV/AIDS. It is estimated that the proportion of maternal deaths caused by indirect causes, mainly HIV/AIDS related infections, increased from 23% to 31% between 1998 and the triennium 1999-2001. In terms of distribution of deaths, it is estimated that nearly half of the mortality occurs during the puerperium, 1/3 during the antenatal period and the rest between early pregnancy and intrapartum period.

The MMR for KZN is not known, but it should not be very far from that estimated for the national level. A study carried out in Jozini by Moodley D. et al. between October 1991 and September 1993 estimated a MMR of 144 per 100,000 live births, with an average age at death of 27 years. This is similar to the MMR estimated for South Africa by the 1998 DHS for the period 1992-1998, suggesting that MMR in KZN is not very far from

[1] A maternal death is any death occurring during pregnancy or within 42 days after pregnancy.

that estimated for South Africa. Considering the rising trends in HIV/AIDS it is likely that MMR in KZN is not less than 175-200 per 100,000 live births.

The most frequent direct cause of obstetric mortality is hypertension. The Confidential Enquiries into Maternal Deaths estimated that in 1999 in KZN 44% of maternal deaths were due to causes not directly connected with pregnancy. The remaining 56% mortality was due to the following pregnancy related direct causes: hypertension, haemorrage, sepsis, embolism, early pregnancy and anesthesia (Figure 1). Early pregnancy deaths occurred under 24 months of gestation and were mainly due to septic abortion and ectopic pregnancies. This profile has not substantially changed in the period 1999-2001 when the most frequent direct causes of deaths continued to be hypertension, haemorrage and sepsis.



From: Second Interim Report on Confidential Enquiries into Maternal Deaths in South Africa for 1999.

These causes of maternal mortality were also the most important ones reported by Bradshaw D et al. in the South Africa Burden of Disease (BOD) Study (Table 1). The highest burden in terms of death rates per 100,000 female population was contributed by hypertension, abortion, haemorrage and sepsis. The higher contribution of abortion is probably due to the adjustment for the under-reporting expected for this cause of death.

Table 1 Maternal death rate per 100,000 female population in 2000 in South Africa

CAUSES	Age groups in years				
	15-24	25-34	35-44	45-54	Total female population
haemorrage	3.1	3.9	3	0.2	1.6
sepsis	1.5	1.5	0.7	0.2	0.7
hypertension	4.6	5	3.1	0.2	2.2
Obstructed labour		0.2			0
Abortion	2.9	4.2	2.6	0.7	1.7
Other maternal conditions	3.2	5.6	3.4	0.2	2

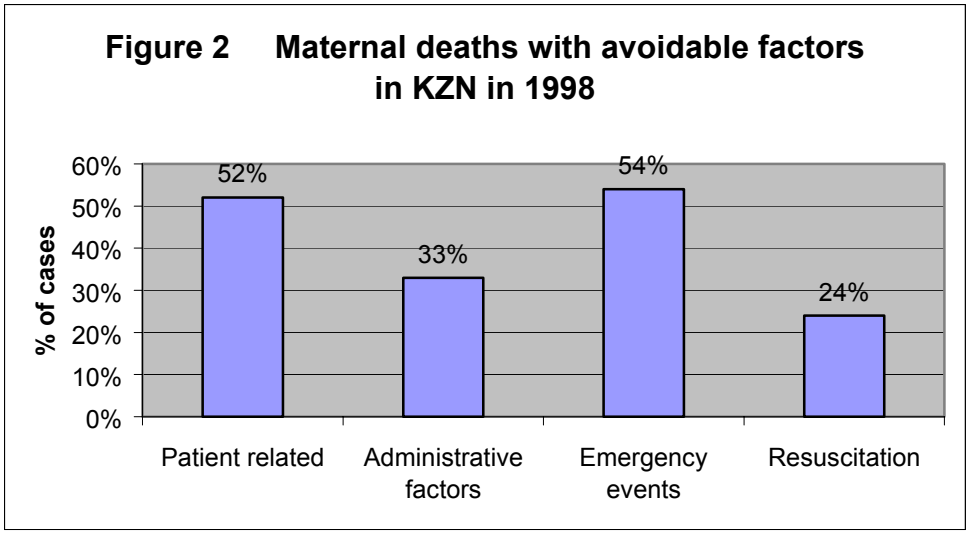
Bradshaw D. et al

Although there is a high coverage of pregnancies by the health services, there is room for improvement. According to the 1998 DHS, almost every pregnant woman received antenatal care from doctors (28%) or nurses (66%), the median number of antenatal visits per pregnancy was 5, and three every four pregnant women were immunized against tetanus. Doctors and nurses performed respectively about one third and half of the deliveries, with almost one in five deliveries performed by cesarean section.

However, the results coming from the Confidential Enquiries into Maternal Deaths showed that in 1998 more than half of maternal deaths had factors that may have contributed to mortality. To understand how these factors are to be interpreted there is a need to summarize the method used by the Confidential Enquiries. Deaths from maternal causes are reported to the National Committee on Confidential Enquiries into Maternal Death (NCCEMD) and a provincial assessor is charged with investigating each case. The assessor evaluates the medical records for the presence of factors that may have contributed to the death. For example, if the assessor judges that a woman had infrequent antenatal visits, could not reach in time an institution because of lack of transport and the institution failed to refer her in time to a higher level institution, the death will count for one patient-related, one administrative, and one emergency related factor. Because each death can contribute several factors, the total sum of their proportion is well above 100%.

The report on the Confidential Enquiries underlines that the presence of "avoidable factors" does not mean that "avoiding these factors would have necessarily prevented death". The presence of factors indicates that "care fell below the standard which the assessor considered should have been offered". The proportion of cases with the presence of these factors are at the basis of the frequency distribution of avoidable factors and the same death will have several factors which are frequently interrelated and overlapping. Each factor is counted as present or absent and therefore each factor has the same weight whatever its importance in causing death.

Avoidable factors are categorized into patient, administrative, emergency and resuscitation related factors (Figure 2). In 1998, the most frequent patient-related factors included infrequent antenatal care and self-induced abortion (Table 2). In the administrative category the most important avoidable factors included lack of Termination of Pregnancy (TOP) services and delay in transport from home to institutions and between institutions. In the emergency category, the most important factors were related to diagnosis, clinical management and monitoring. The resuscitation category included lack of special monitoring and subsequent management.



Report on Confidential Enquiries in South Africa 1998

Table 2 Avoidable factors of maternal deaths in KZN in 1998

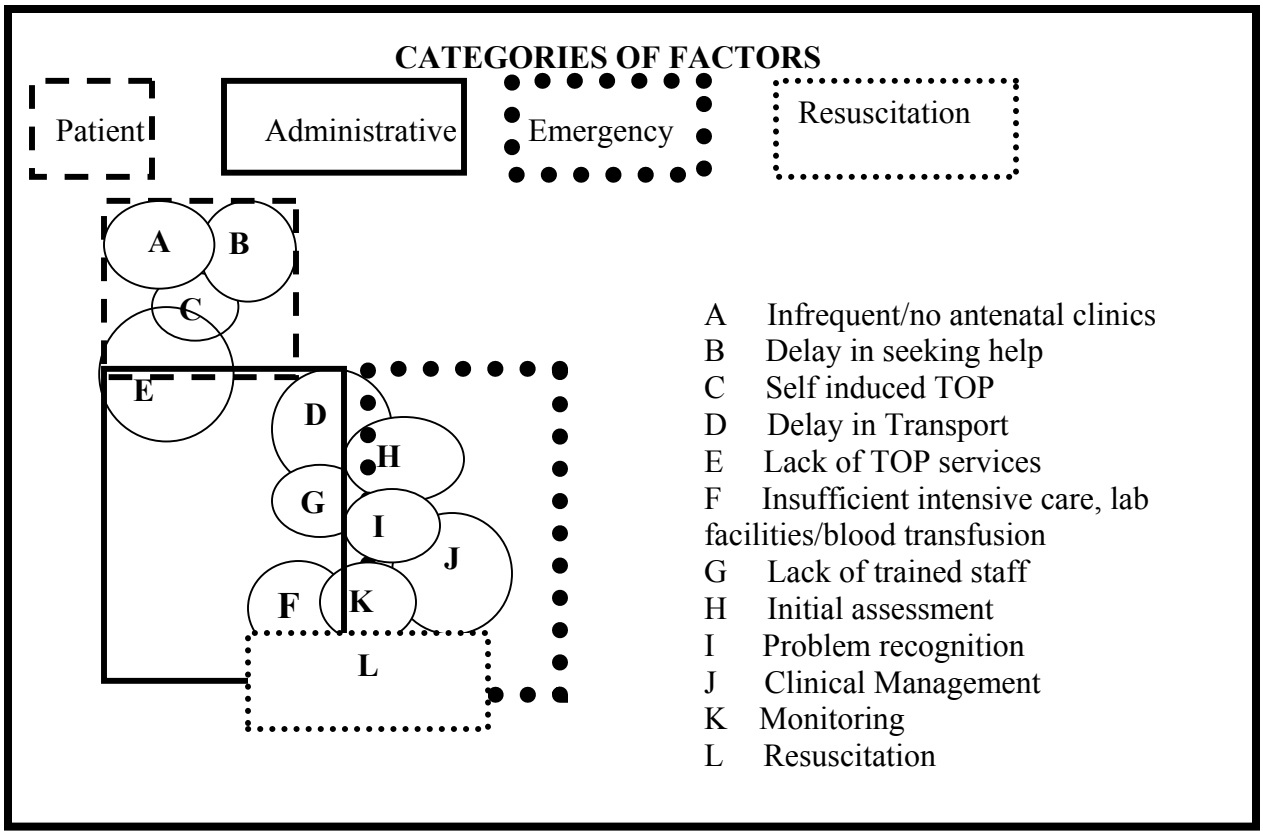
Category	Problem	%
Patient orientated	Non attendance or infrequent attendance to antenatal care	26
	Delay in Seeking help	23
	Self-induced TOP	8
	Discharge herself from hospitals	1
Administrative factors	Delay in transport	26
	Lack of TOP services	33
	Insufficient Intensive Care Unit beds	11
	Lack of laboratory facilities	1
	Lack of availability of blood transfusion	3
	Lack of trained staff and lack of communication	6
Emergency events	Initial assessment	23
	Problem recognition	26
	Clinical Management:	
	- more senior staff not called / not available	10
	-delay in referral	12
	-patient managed at inappropriate institutions	11
	-wrong diagnosis	12
	-standard protocol not followed	41
	-delay in treatment/inadequate skills	6
	Continued Monitoring:	
	-no notes	2
	-failure to get investigation results	4
	-infrequent observation	19
	-observation without action	4
Resuscitation	Breathing not supported	3
	Circulation not supported	6
	Drugs not given	1
	Investigation not done	1
	Special or ongoing monitoring not done	8
	CVP not inserted	1
	Subsequent management not planned	11

Report on Confidential Enquiries in South Africa 1998

Although the above statistics helps to provide a description of the avoidable factors the method of assigning causation could be improved. Figure 3 shows how the factors listed in Table 2 may easily overlap, making an estimation of the attributable fraction (AF) associated with a certain factor difficult. The AF is the proportion of mortality that could be reduced by eliminating each factor. AF can be summarized as (Mp-Mu)/Mp where Mp is the mortality in the total female population in fertile age and Mu is the mortality in the female population in fertile age which was not affected by the factor.

This estimation is difficult because the objective of the Confidential Enquiries is to check for the presence of any factor according to a checklist and not to estimate the attributable risk of mortality associated with each factor. Therefore, each factor is given the same weight whatever its direct link with death, with many factors overlapping between them. A clearer chain of causation with weights reflecting the importance of each factor according to their direct causal link to each death could improve the estimation of the proportion of the mortality that would be reduced if the factor were reduced/eliminated. This would help to identify the specific actions that have more likelihood to influence mortality by acting on a direct factor or on a cluster of factors.

Figure 3 Interelationships and overlap of avoidable factors



Another issue to be assessed is the feasibility of implementing the interventions to tackle the avoidable factors. Feasibility is not always assessed in its overall complexity as demonstrated by the difficulty encountered in implementing the Termination of Pregnancy (TOP) Act. One of the avoidable factors of maternal mortality is the limited access to the TOP services, which were liberalized by law in 1996. According to the law, TOP is allowed during the first 12 weeks of gestation upon the request of the woman. Between the 13th and 20th week, TOP is allowed for medical reasons, rape, incest, social and economic circumstances and severe abnormalities of the foetus. After the 20th week of gestation, TOP can be carried out if the continuation of the pregnancy poses a risk for the life of the woman or in case of severe foetal malformations.

In 1999, the DOH has carried out an evaluation of the implementation of the choice on termination of pregnancy act. Of the facilities designated to provide TOP, KZN had the lowest proportion of functioning facilities among the provinces. Only 12% of the designated facilities had performed a TOP in the previous four weeks compared with a national average of 32%. KZN had a lower number of TOP per 100,000 women in the fertile age group and there was a high proportion of the target population living beyond 50 km from a service providing TOP.

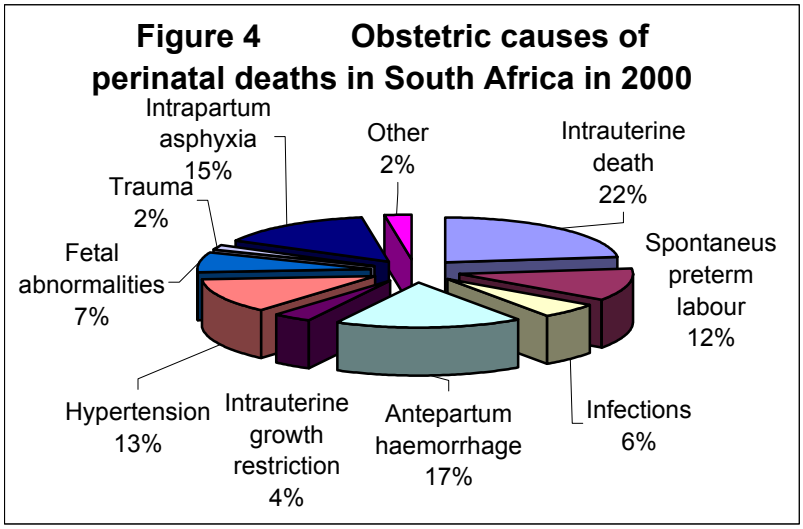
Besides a problem of geographic access, there are other types of problems, including staff attitude and stigma associated with abortion. Harrison A. et al. found a strong opposition among the staff and the general population towards TOP on demand, while TOP was more accepted in the case of rape, incest and severe health problem. The presence of strong norms and values against abortion suggests that the feasibility of implementing the TOP is related to several factors, which are difficult to tackle. Information campaigns may improve the lack of knowledge about the right of women to receive TOP, but it is unlikely that information will be sufficient to influence strong values against TOP among the staff and the population. More training could provide needed skills but there may be insufficient staff willing to be trained. This situation, which is caused by strong norms and values, is probably the reason behind the low proportion of facilities implementing TOP and the persistence of illegal abortion.

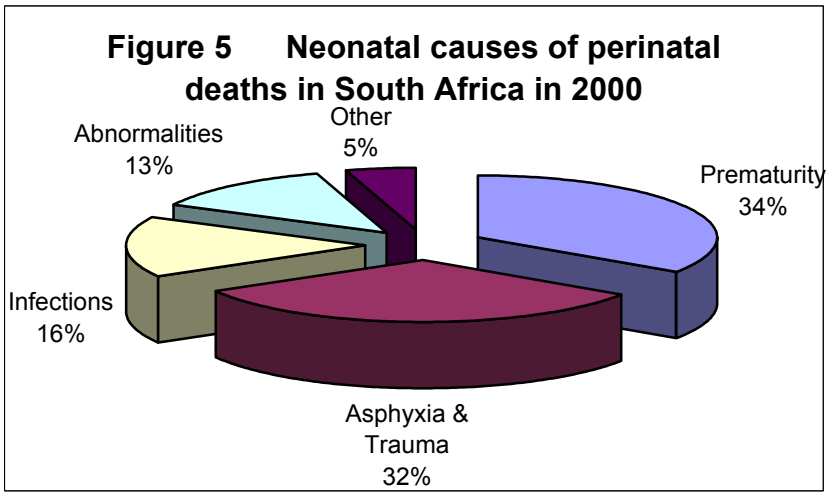
Last but not least, the definition of what is avoidable and what is not depends on the costs involved and the resources available to finance the necessary actions to tackle the avoidable factors. Providing transport in the most remote areas make “lack of transport” an avoidable factor if the budget allows to avoid it. However, if the budget is insufficient to expand the ambulance fleet to cover the most remote areas, the “lack of transport” may become “un-avoidable” for a sizable geographic area. The definition of what is avoidable and what is not depends on the costs to finance the interventions and the availability of the relative resources. Due to the increasing incremental costs associated with the expansion of coverage beyond a certain point, there are limitations to what the health services can do to cover the entire target population. Therefore, incremental costs for different levels of coverage of the population in rural and urban areas should be estimated for a series of alternative strategies.

Perinatal Conditions

The perinatal mortality includes stillbirths and early neonatal deaths. According to the classification used in South Africa, stillbirths begin at the 28th week of gestation or at a weight of 1000 grams and above. The perinatal mortality rate is equivalent to the number of stillbirths plus the newborns dying in the first week of life per 1000 births.

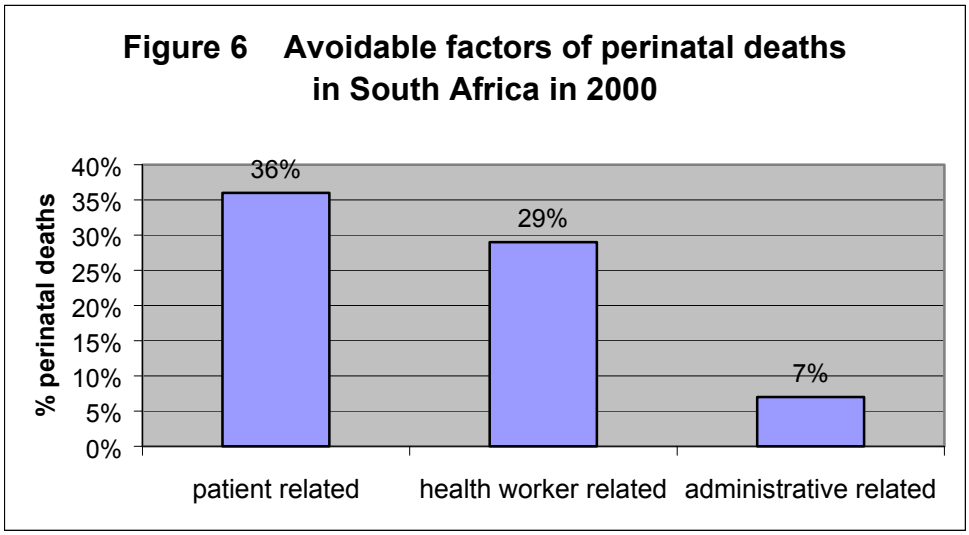
Reliable estimates on perinatal mortality rates for KZN are scarce. Sentinel sites across South Africa have been participating to the Perinatal Problem Identification Programme since the late 1990s. According to the report "Saving Babies" based on this sentinel system, perinatal mortality rate in South Africa was around 40 per 1000 births in the year 2000. The most important primary obstetric and neonatal causes are in figures 4 and 5.





From the report: "Saving Babies"

The avoidable causes were related to patient, health worker and the administrative factors (Figure 6). The most common patient related factor was infrequent/no antenatal care, the health worker factors were related to the diagnosis and delay in taking proper actions to problems encountered, and the main administrative factor was lack of transport. The problems described before for the avoidable factors are valid for these factors as well.



From the report: "Saving Babies"

The most recent statistics on perinatal mortality for KZN is from a research carried out by Gandhi M. et al. in Jozini district in 1999. The perinatal mortality was 29 per 1000 births and the most frequent obstetric causes of death were in order of importance: stillbirths, intrapartum asphyxia, preterm labour, infections, fetal abnormalities and antepartum haemorrage. The main causes of early neonatal mortality were: asphyxia and birth trauma, prematurity, infections and congenital abnormalities.

More recent estimates suggest that perinatal mortality in KZN is between 45 and 50 per 1000 births. According to the most recent data presented at the Third Saving Babies Workshop held in Pretoria in November 2002, perinatal mortality for KZN between April and September 2002 was 43 per 1000 births. These estimates are based on a higher coverage of government hospitals and a higher quality of data than before. Because these statistics do not include the deliveries at home, it is likely that perinatal mortality is slightly higher, in the order of 45-50 per 1000 births.

About 10%-18% of newborns in KZN have a low birth weight (<2500 grams). According to the 1998 DHS, 9.5% of deliveries in KZN were of low birth weight, while according to the last Health Statistical Information from the DOH, the low birth weight rate in the health institutions was 11% in Fiscal Year 2001/02. The sentinel sites of the Perinatal Problem Identification Programme estimated a low birth weight between 12% and 18% across the country in the year 2000. According to the data presented at the Third Saving Babies Workshop held in Pretoria in 2002 low birth weight rate in KZN was 18%.

Nutritional Conditions

Nutritional status is maintained through the intake and absorption of macro and micronutrients. Macronutrients include proteins, fats and carbohydrates, which contribute to essential amino acids, fatty acids and energy. Micronutrients include vitamins and minerals such as vitamin A, iodine and iron, which are essential for maintaining specialized physiological functions. A decline in macronutrients produce slower growth and loss of weight, a decline in micronutrients produces iron deficiency anaemia, goitre and vitamin A deficiency. These conditions are associated with increased morbidity and mortality.

The most severe clinical form of malnutrition such as kwashiorkor and marasmus are unlikely to be common in KZN. According to Harrison **"**Malnutrition may be endemic in regions of famine, and two forms of severe malnutrition are recognized under conditions of inadequate food supply or distribution. Marasmus refers to generalized starvation with loss of body fat and protein, whereas kwashiorkor refers to selective protein malnutrition with edema and fatty liver. The latter form occurs following restriction of dietary protein among children in settings of recurrent diarrheal illness. These distinctions, however, seldom apply to malnourished patients in more developed societies." Because KZN is not an area characterized by acute shortage of food the prevalence of the above severe forms of clinical malnutrition is likely to be low.

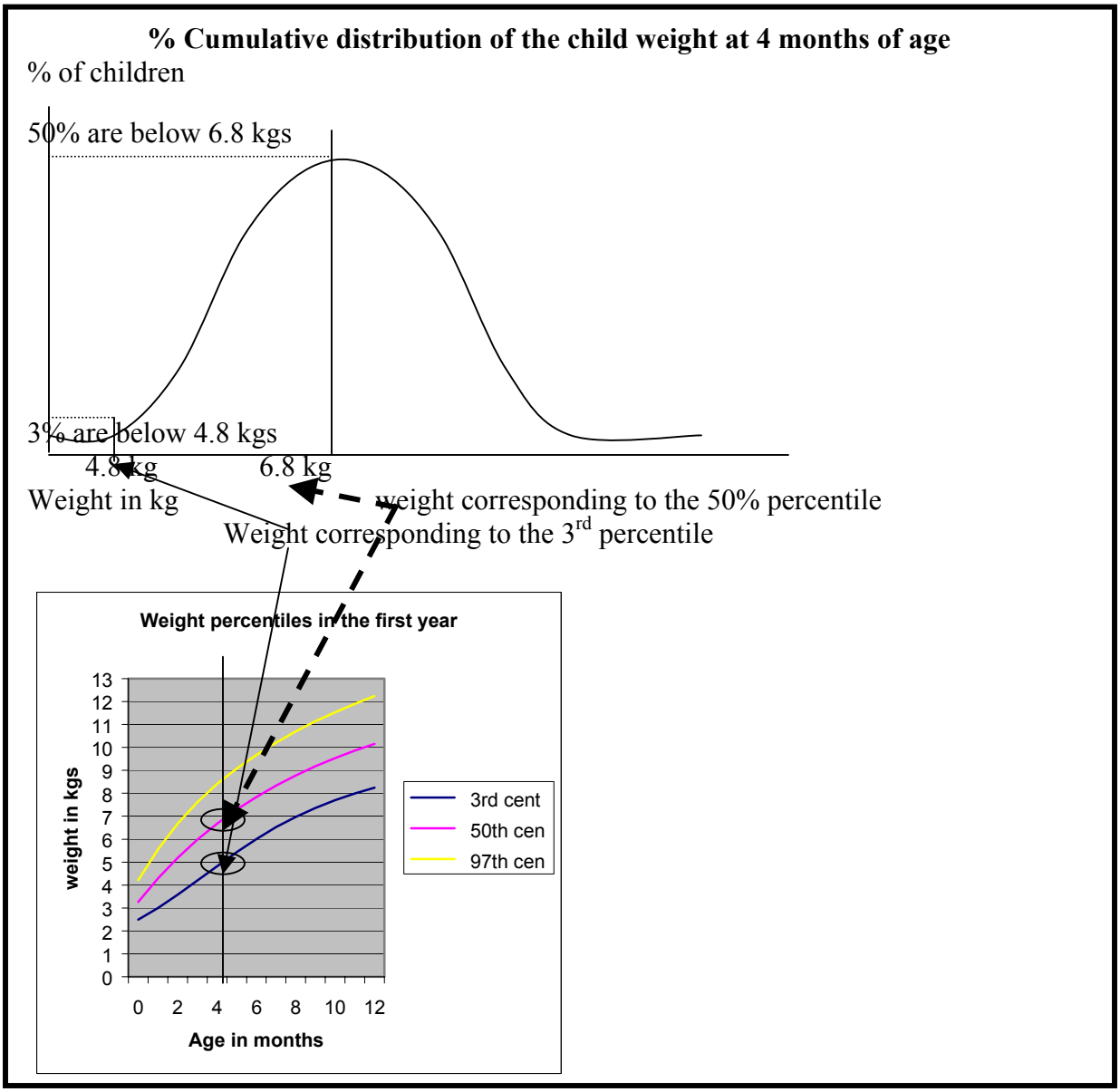
The more frequent nutritional problems experienced in KZN are subtler than the acute clinical forms mentioned above and they produce a slower child growth measured through anthropometric parameters.

Anthropometric Indicators

The most used anthropometric indicators for preschoolers are derived by comparing the child's weight and height with that expected according to the international standard. Weight for age (W/A) is estimated by comparing the weight of a child of a certain age with that expected for that age according to the standard. Height for age (H/A) is obtained by comparing the height of a child of a certain age with that expected for that age according to the standard. Weight for height (W/H) is the comparison of the weight of a child of a certain height with the weight expected for that height according to the standard.

Child growth is monitored by comparing the weight of the child with the growth curves of the growth chart. Figure 7 provides a visual description of what a growth chart means and how the percentiles are built. As an example, figure 7 represents the weight distribution expected among children of four months of age according to the international standard. Because 50% are below 6.8 kg and 3% are below 4.8 kg, these weights are respectively the 3rd and the 50th percentile for the weight distribution at the age of four months as reflected in the growth curves in Figure 7. This process, repeated for all the age groups, is at the basis of the growth curves of the child health card.

Figure 7 Percentile distribution of the weight for age



Malnutrition in clinical settings

Anthropometry is used in clinical and population settings. The growth of children attending clinics is monitored by comparing their weight with the growth chart of the health card. The growth curve in the middle of the growth chart provides the central tendency or the 50th percentile, while the curves above and below represent above and below average growth. The lowest curve below the 50th percentile is the 3rd percentile, below which about 3% of children fall. This cut off point is selected because a child with this weight is very likely to be malnourished.

The major nutrition problem among children is failure to grow according to the growth curve outlined in the child health card. Growth monitoring is used in clinical settings to compare the weight and the height of a child with the values expected according to the growth curves. When the weight falls below the 3rd percentile, the child is considered malnourished. Growth monitoring is effective only when it is accompanied by an identification of the reasons behind the poor growth and by the provision of feasible solution on what to do to improve nutrition.

According to the last Health Statistical Information from the DOH, about 2% of the children weighed in clinics were severely malnourished. Severe malnutrition in this context was defined as a weight less than 60% of that expected according to age or to suffer from marasmus or kwashiorkor. This confirms that although there is a problem of severe malnutrition in clinics, the proportion of children with marasmus and kwashiorkor is relatively low.

Malnutrition in the population

While the percentiles are used in clinical settings, standard deviations (SD) are used in surveys. In the case of population measurements, it is customary to use the cut off point of –2 SD from the 50th percentile. This is based on the fact that the prevalence of children who are below –2 SD from the 50th percentile of the standard W/H, H/A and W/A should be around 2.5%. The most recent anthropometric survey with representative data for the preschool population of KZN was the National Food Consumption Survey (NFCS) carried out in 1999. Wasting or acute malnutrition among children 1-6 years old was around 3.7%, which is only slightly higher than the expected 2.5%. Stunting was 21%, which is relatively high compared with the expected 2.5% found in normal populations, but not as high as the prevalence found in most Sub-Saharan Africa, where according to Murray C.J.L and Lopez A.D., stunting among preschoolers is around 41%. As stated in the report of the NFCS of 1999 the survey found "a low [(<5%)] prevalence of wasting, a low [(10%)] prevalence of being underweight and a medium [(20-29.9%)] prevalence of stunting". Although nutritional status needs to improve especially in terms of stunting, the NFCS report acknowledged that "South African children appear to have a more favourable nutritional status than children elsewhere in Africa, Central and South America, and in the Indian peninsula".

The adult population of KZN is affected by both under and overnutrition. Adult nutritional status is measured according to the body mass index (BMI) that is obtained by dividing the weight in kilograms by the height in square meters. A BMI under 18.5 defines undernutrition while a BMI 30 and above defines obesity. According to the 1998 DHS, undernutrition measured as BMI<18.5 was 31% and 14% respectively among males and females adolescents between 15 and 19 years of age. The prevalence of undernutrition among all adults 15 years and over was 11% among males and 5% among females who instead had a very high prevalence of obesity (35%) measured as BMI >=30.

Micronutrient deficiencies

The only available provincial data on micronutrient deficiencies are from the 1994 South Africa Vitamin A Consultative Group survey (SAVACGS). The SAVACGS used the cut off points summarized in table 3 to define iron and vitamin A deficiency.

Table 3 Cut off points for vitamin A and iron deficiency

Vitamin A deficiency		**Iron deficiency anaemia**	**Haemoglobin g/dL**	**Ferritin in microgr /dL**
Deficiency	Serum retinal <10 micrograms/dL	**Severe**	<7	<10
Marginal deficiency	10-19.9 micrograms/dL	**Moderate**	7-9.9	<10
		Mild	10-11	<12

SAVACGS

The SAVACGS found that in KZN, anaemia was lower than in the rest of South Africa, while marginal vitamin A deficiency was frequent. KZN had the highest mean Haemoglobin (Hb) concentration and the lowest prevalence of anaemia (Hb<11 g/dL) among the provinces. If we consider haemoglobin alone or haemoglobin plus ferritin below the defined cut off points indicated in table 4, preschoolers in KZN had almost half the rate of anemia recorded at the national level. In KZN, the prevalence of children with Hb<11 g/dL was 10% compared with 21% in South Africa. About 3.5% of preschoolers in KZN had low levels of both Hb and serum ferritin versus the 5% estimated for the whole country. The relatively low frequency of anaemia could be the result of high iron intake associated with the use of traditional iron cooking pots, as suggested by the presence of iron overload reported in the literature.

Table 4 Anaemia among preschoolers in 1994

Cut off points	**KZN**	**SA**
Hb <11g dL	10.4 (7.1-13.6)	21.4 (19.4 – 23.4)
Hb <11g d/L & ferritin <12	3.5 (1.4-5.6)	5 (4.1-5.8)

SAVACGS

The SAVACGS showed a relatively high prevalence of marginal Vitamin A deficiency. The prevalence of preschoolers with serum retinol below 10 microgrammes per dL, was 2.6%; while marginal deficiency, which was defined by a serum retinol between 10 – 19.9 microgrammes per d/L was 35%. The marginal Vitamin A deficiency reported in the above mentioned surveys are cause for concern because it is associated with higher morbidity and mortality.

Oelofse A. et al. carried out a survey on micronutrient indicators in the year 2000 in a small community 60 km from Durban. Although the survey is not representative of the

province, its results are the most updated available for a locality in KZN. Anaemia[2] was 24% among preschoolers, 22% among children 6-11 years old, and 22% among their mothers. The prevalence of marginal vitamin A deficiency measured as serum retinol below 20 microgrammes dL was respectively 45% among preschoolers and 51% among school children 6-11 years old. Because these estimates are not representative of the whole province, it is not possible to conclude that the situation has deteriorated compared with what found by SAVACGS in 1994.

Oelofse A. et al. found in the same survey that iodine deficiency was relatively frequent. The above-mentioned survey carried out near Durban found palpable and visible goitre in 22% of schoolchildren and 27% of their mothers. Because, there has been compulsory salt iodization in the last few years, the goitre prevalence is likely to have declined.

Causes and consequences of malnutrition

The above findings suggest the presence of a nutrition transition where level of under and over nutrition coexist. The low prevalence of wasting and the medium prevalence of stunting suggest that there is no acute shortage of food there are sections of the population with insufficient access to food. The 1999 food consumption survey found that although children in KZN had one of the highest energy intake compared with the other provinces, the mean caloric intake was 87% of the recommended intake among children 1-3 years old and 78% of the daily requirements among children 4-6 years old.

The insufficient caloric intake was also associated with low consumption of fruits and vegetables. The 1999 food consumption survey found that intake of Vitamin A and other micronutrients was below the recommended dietary allowances, which besides producing the marginal vitamin A deficiency is a sign of low intake of fruits and vegetable. This low consumption besides producing micronutrient deficiencies has other side effects, because fruits and vegetables decrease the actions of carcinogens and produce antioxidant effects that prevent DNA damage. According to the 2002 World Health Report, low intakes of fruits and vegetables cause 19% of gastrointestinal cancer, 31% of ischaemic heart diseases and 11% of stroke worldwide.

The presence of undernutrition among adolescent males and the high levels of obesity among adult females found by the 1998 DHS confirm the presence of both under and over nutrition. This situation is common to many countries, which are in a state of transition. According to the World Health Report 2002, as countries develop, undernutrition coexists with overnutrition because of the increasing proportion of calories drawn from sugar, manufactured food and cheep oil. These changes, together with decreased physical activity lead to obesity and related communicable diseases. This is typical of the socioeconomic changes characterizing a phase of transition in the developmental conditions of a country.

[2] Measured as Hb<12 g/dL for women and children 6 and above, and as Hb<11 g/dL among children <6

Nutritional undernutrition and overnutrition contribute to a sizable proportion of the burden of disease. According to the World Health Report 2002 underweight, overweight, high cholesterol, low consumption of fruit and vegetables and iron deficiency cause about 12% of total burden of disease in low mortality developing countries. The risk of disease increases progressively with the increase of BMI because overweight and obesity have negative consequences on blood pressure, cholesterolemia and trigliceridemia, and insulin resistance. This produces a high risk for coronary heart disease, stroke and type 2 diabetes mellitus. Other effects are increased risk for osteoarthritis and some types of cancers probably induced through hormonal changes. A reduction in obesity would reduce cardiovascular diseases, hypertension, diabetes and some types of cancers. A nutrition education campaign is urgently needed, but even a well thought campaign would take a while to produce a correction in dietary habits that would reverse the trends in obesity. Therefore, it is unlikely that the high toll in terms of cardiovascular diseases, hypertension, diabetes and other negative consequences will be avoided for the next few years to come. The next issue of the Bulletin will deal with these and other chronic degenerative disorders.

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