

Impact of a nutrition education programme on nutrition knowledge and dietary practices of lower socioeconomic communities in the Free State and Northern Cape

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Objective. To determine the impact of a nutrition education programme, implemented using local nutrition advisors, on knowledge of nutrition and dietary practices in low-income coloured communities in the Free State and Northern Cape provinces.

Study population and methods. A nutrition education and food aid programme was implemented for 2 years in one urban and three rural areas. Two rural control areas were included where food aid was given, but no nutrition education. Knowledge of nutrition and dietary practices were measured using a structured questionnaire before (608 respondents) and after intervention (672 respondents).

Results. In contrast to control areas, knowledge of what to eat daily to remain healthy improved significantly by between

42.2% and 52.6% in rural intervention areas. The percentage of rural households that included three food groups (protective foods, energy foods and building foods) in their cooked meal improved by 32.6 - 38.8%. Improvements of between 7.0% and 12.9% were observed in the percentage of respondents who knew that milk is healthier to drink than non-dairy alternatives. The median percentage of household members using more than two cups of milk per day improved significantly, by between 14% and 100%. A significant improvement in vegetable and fruit intake was also observed.

Conclusions. A community-based nutrition education programme can contribute to knowledge of balanced, economical nutrition and dietary practices in low-income communities.

Very few data exist concerning the nutritional knowledge of poor communities in low and middle-income countries such as South Africa.¹ The extent of nutritionally related diseases, especially those of undernutrition in black²⁻¹⁴ and coloured^{4,11,15-19} communities in South Africa, seems to indicate, however, that dietary practices leave much to be desired. The diets of South African coloured communities have been reported to be deficient in many nutrients,²⁰ and the nutritional status of children has been shown to be less than optimal.¹⁸

While considerable work has been done on determining the incidence of the various forms of malnutrition in the world, much less attention has been given to prevention of the problem. According to UNICEF²¹ inadequate dietary intake and disease make up the immediate causes of malnutrition. The underlying causes of malnutrition are, however, a result of insufficient household food security, inadequate maternal and child care and poor health services and sanitary conditions. Factors that give rise to poverty, such as unemployment, maldistribution of resources and political influences, can be described as the basic causes of malnutrition.

Poor knowledge of nutrition plays a role in most of the multi-sectoral factors involved in the development of malnutrition.²¹ Inadequate food intake and unhygienic dietary practices are often related to poor knowledge of sound nutrition practices. Together with limited resources, deficiencies in knowledge of sound budgeting, food purchasing and food preparation methods can compromise household food security.

The aim of the study was to address the malnutrition problem in coloured communities using a nutrition education intervention, and to determine the impact of the programme on knowledge of nutrition and dietary practices.

Subjects and methods

The intervention

The Nutrition Education Intervention Programme (NEIP) was developed in the Free State between 1992 and 1995, based on the principles of the previous Administration: House of Representatives.

The programme used nutrition advisors as community health workers. Nutrition advisors were local persons with nutrition as their first priority, appointed in communities where the infant morbidity and mortality rates were high. They were respected members of the community, trained to improve the community's knowledge of balanced, economical

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nutrition using the three food group approach, where energy foods include starches and fats, protective foods include vegetables and fruit, and building foods include proteins and milk. In addition to education, nutrition advisors were involved in service functions such as nutrition monitoring (e.g. growth monitoring and breast-feeding monitoring) and establishing self-help programmes, such as communal gardens, play groups for children (concentrating on nutrition-related activities) and women's sewing groups.

Training of nutrition advisors by the dietitian or nutritionist responsible for the supervision of that advisor took place on a bi-monthly basis in the community. Although nutrition instruction training manuals were used to ensure uniformity and replicability, attention was given to the specific nutritional needs in the community. Manuals include information on themes such as malnutrition, the growth chart, infant feeding, balanced meals, the three food groups, meal and menu planning, food hygiene, nutrition during the life-cycle, the vegetable garden, the family budget and sensible food purchasing. Advisors were required to practise skills under supervision until a satisfactory standard was attained. As soon as the training for a certain topic was completed successfully, the nutrition advisor could begin nutrition education on that topic in the community using an aid best suited to the specific community and target group.

The use of unconventional methods and techniques for conveying health information in communities has been advocated by the World Health Organisation (WHO).²² This principle was adopted for the intervention. Methods of instruction included role play, singing, demonstrations, workshops, discussions, home visits and puppet shows. Every month the nutrition advisor kept a simple record of statistics including the various interventions that she had undertaken that month, topics covered and number of persons reached.

Surveys

The study was undertaken in lower socioeconomic communities in the Free State and Northern Cape between 1992 and 1995. Both an intervention group and a control group were included. At the time of the study a food aid programme (the National Nutrition and Social Development Programme) was being implemented by the government (consisting of a parcel containing foods such as oil, legumes, bread flour, milk powder, sugar and peanut butter that was distributed to families monthly). In intervention areas, both the food aid programme and the NEIP were implemented. In the control areas the food aid programme was implemented, but no nutrition education was given.

One urban area (Heidedal), a relatively large rural area (Ritchie), and two small rural areas (Jagersfontein, Fauresmith) comprised the experimental group, while two small rural areas (Trompsburg and Bethulie) were included as controls. The

areas were all relatively uniform as regards climate, socio-economic status and health services. Extensive nutrition education and food aid had not been implemented in these areas before the study.

Approximately 30% of households in Heidedal and Ritchie were selected for interviews by simple random sampling of all households numbered on township maps. Different samples were selected for the initial and follow-up surveys to ensure that advisors would not only target sample houses. All households in the small rural areas were included. A total of 608 households in the six towns were visited as part of the initial survey in 1992, and 672 households in the same six towns were included as part of the follow-up survey undertaken in 1995.

The initial and follow-up household surveys were undertaken using a comprehensive structured questionnaire (standardised in a pilot study) completed by a nutritionist or nutrition advisor in an interview situation.

Reliability testing was introduced in a random sample of approximately 20% of households interviewed in the follow-up survey. The interview was repeated in these households by a different interviewer within a week to a month of the follow-up survey. Where more than 20% of answers differed for a question, they were considered unreliable and the question eliminated from the results.

The results of the initial and follow-up surveys for each area are described by frequencies and percentages of the various responses to each question in the questionnaire. The difference in the percentage of correct answers was determined between the initial and follow-up surveys, and 95% confidence intervals (CIs) (level of significance 0.05)²³ were calculated to determine the significance of the differences, using the SAS software.²⁴

Results and discussion

Only descriptive results pertaining to the initial survey are reported for the demographic profile and household information, since no significant differences between the data for the initial and follow-up surveys were found.

Demographic and household profile of respondents

The youngest respondent was 16 years old and the oldest claimed to be 109 years old. The majority of respondents were female (89.1%) and the mother of the household (83.9%).

The percentage of respondents without schooling was much higher in the rural areas (from 24.2% in Trompsburg to 49.1% in Jagersfontein) than in the urban area of Heidedal (9.2%). In Heidedal most respondents had an educational level between grade 5 and 12, with a median of grade 8. In rural areas most respondents had very little or no schooling. Although a large proportion of breadwinners were employed (from 37.7% in

Bethulie to 50.5% in Heidedal), a large proportion were either unemployed or received a pension (either a disability pension, old age pension or child allowance). A room density of more than one person per room was found in most households, with as many as nine persons per room in some households. One would expect the room density to have been higher in the urban area of Heidedal (median number of 1.5 persons/room) than in the rural areas (median number of 1.0 - 2.0 persons/room), but this was not so.

In all rural households a primus or gas plate was most commonly used to cook food (ranging from 54.9% in Ritchie to 95.3% in Fauresmith). In Heidedal 41.4% used an electric stove or an electric plate and 20.2% a coal or gas stove. A significant number of households in Ritchie (21.3%), Trompsburg (25.8%) and Bethulie (14.5%) also relied on a coal or gas stove to cook their food. In Heidedal more than half the households had a refrigerator or a freezer, while most rural households did not have these facilities. Groceries were mostly bought on a monthly basis by the mother, who was also usually responsible for food preparation.

Knowledge of nutrition and dietary practices

A positive impact of the nutrition education programme was observed on many aspects of dietary knowledge and practices. The intervention included both nutrition education and food aid in combination, and results are interpreted with this in mind. It is probable that the nutrition education programme would have had a positive effect without food aid, but we are unable to draw conclusions related to the benefits of such a programme in the absence of food aid.

The purpose of including control areas was to be able to infer whether any changes seen in the intervention areas were indeed attributable to the intervention. Owing to the limited number of control towns available (nutrition advisors had already been appointed in all other urban regions in the study area), baseline differences did occur between intervention and control towns. These differences are taken into account in the interpretation of the results. Improvements seen in the urban area are not directly ascribed to the intervention, but indicate how the intervention might affect larger communities. Owing to data being eliminated on the basis of reliability, the number of areas to be compared decreased for certain questions. Although this can be considered a limitation of the study, the percentage of unreliable answers was only 11.3%.

The percentage of respondents who answered correctly in the initial survey and the percentage who answered correctly in the follow-up (second) survey, as well as the difference in the percentage of correct answers (follow-up — initial) and the 95% CIs are indicated in Table I. Changes in dietary practices are indicated by differences in median intake.

One of the main components of the NEIP concerned balanced meal planning. Communities were taught to plan

healthy meals according to the three food group approach. Despite the controversy regarding the use of food groups for nutrition education in developing countries,²⁵ this approach has been used successfully.²⁶ We have found the approach to have merit in our study as indicated by the improvement in knowledge and dietary practices after the NEIP had been implemented for 2 years. Special emphasis was, however, placed on the use of economical staple foods such as maize porridge that are readily available, within the three food group approach. Although improvements in certain aspects of balanced meals were also observed in control areas (probably as a result of food aid), none of the improvements were significant.

Before implementation of the NEIP, the majority of respondents in all areas ate three or more meals per day, leaving little room for improvement. After 2 years of intervention, however, a close to significant improvement of 10.1% was found in Ritchie. Most of the respondents in all areas did not know that pre-school children should eat more than three times a day. After implementation of the NEIP, however, significantly more respondents in two intervention areas were aware of this. In contrast to the rural areas, most respondents in the initial survey in Heidedal knew that one should include meat, starch, vegetables and milk in the daily diet in order to remain healthy. If the daily cooked meal included the three food groups, namely energy (starches and fats), building (protein and dairy) and protective foods (fruits and vegetables), it was considered balanced. Before the intervention, most households in rural areas reported eating only energy and building foods. After the NEIP, however, a significant improvement in knowledge of what to eat and reported practices was found in all four intervention areas, whereas in the two control areas only a slight, insignificant improvement was observed (Table I).

The percentage of respondents who used full-cream milk or skim milk, to drink or over porridge, instead of blends, condensed milk and coffee creamers, was high in all areas (more than 85.0%), even before implementation of the NEIP. Despite this, a significant or close to significant improvement was achieved in all intervention areas, but not in control areas (Table I). The Expanded Food and Nutrition Programme²⁷ that was implemented among low-income families in the USA, also reported improved milk intake. This was ascribed to nutrition education with a community-involved approach, similar to that used for the NEIP.

The majority of respondents living in rural areas used a coffee creamer in tea and coffee, while in the urban area of Heidedal, 64.0% used either full-cream or skim milk. Although fewer respondents used coffee creamers after the intervention, a large percentage of respondents continued to do so despite the fact that significantly more respondents knew that milk is healthier than coffee creamers after the intervention. The

Table I. Percentage correct answers and median responses

Parameter	Intervention				Control	
	Heidedal N1=208 N2=208 % Initial % Second Diff. in % (95%CI)	Ritchie N1=122 N2=124 % Initial % Second Diff. in % (95%CI)	Jagersfontein N1=116 N2=96 % Initial % Second Diff. in % (95%CI)	Fauresmith N1=85 N2=85 % Initial % Second Diff. in % (95%CI)	Trompsburg N1=62 N2=81 % Initial % Second Diff. in % (95%CI)	Bethulie N1=69 N2=78 % Initial % Second Diff. in % (95%CI)
Balanced meals						
Recommended	89.4	73.0	96.6	91.8	88.7	81.1
no. of meals/day	89.0	83.1	92.7	95.3	90.1	85.7
3 and > 3	-0.4 (-6.4, 5.6)	10.1 (-0.2, 20.4)	-3.9 (-10.1, 2.3)	3.5 (-3.9, 10.9)	1.4 (-8.8, 11.6)	4.6 (-7.5, 16.7)
Times/day must	49.0	44.3	37.9	32.9	27.4	44.9
child < 6 yrs eat?	81.3	*	85.4	*	44.4	59.0
> 3	32.3 (23.7, 40.9)	*	47.5 (36.2, 58.8)	*	17.0 (-1.5, 32.5)	14.1 (-1.9, 30.1)
Eat daily to	81.2	39.3	47.4	54.1	37.1	49.3
remain healthy?	96.6	81.5	100.0	98.8	46.9	60.3
Meat, starch,	15.4	42.2	52.6	44.7	9.8	11.0
vegetables & milk	(9.5, 21.3)	(31.2, 53.2)	(43.5, 61.7)	(33.9, 55.5)	(-6.4, 26.0)	(-5.0, 27.0)
Main meal	77.9	28.7	19.0	24.7	19.4	27.5
consists of	85.6	61.3	56.3	63.5	17.3	15.4
Energy + building	7.7	32.6	37.3	38.8	-2.1	-12.1
+ protective foods	(0.3, 15.1)	(20.9, 44.3)	(25.1, 49.5)	(25.1, 52.5)	(-14.9, 10.7)	(-25.3, 1.1)
Milk						
Best milk to drink	95.1	85.2	88.8	83.6	95.1	88.4
Skim + full cream	100.0	92.7	95.8	96.5	92.6	85.9
(instead of blends	4.9	7.5	7.0	12.9	-2.5	-2.5
and creamers)	(2.0, 7.8)	(-0.3, 15.3)	(0.0, 14.0)	(4.1, 21.7)	(-10.3, 5.3)	(-13.3, 8.3)
Best milk for	64.0	33.6	20.7	14.1	19.4	46.3
tea and coffee	73.1	37.1	*	30.6	38.2	48.7
Skim + full cream	9.1	3.5	*	16.5	18.8	9.6
	(0.2, 18.0)	(-8.4, 15.4)		(4.2, 28.8)	(4.3, 33.3)	(-6.4, 25.6)
Milk needed/day	44.2	77.1	59.2	55.3	27.4	52.2
by child < 6 yrs	*	51.6	78.1	81.2	*	46.2
2 - 3 cups + > 3 cups	*	-25.5 (-37.1, -4.0)	18.9 (6.7, 31.1)	25.9 (12.5, 39.3)	*	-6.0 (-22.2, 10.2)
Creamers or milk	91.3	87.7	47.4	43.5	58.1	71.0
healthiest?	93.3	87.1	98.9	97.6	66.7	65.4
Milk	2.0	-0.6	51.5	54.1	8.6	-5.6
	(-3.1, 7.1)	(-8.9, 7.7)	(42.2, 60.8)	(43.1, 65.1)	(-7.4, 24.6)	(-20.6, 9.4)
% persons using >	29.0 [†]	0.0 [†]	0.0 [†]	0.0 [†]	0.0 [†]	17.0 [†]
2 cups milk/day	100.0 [†]	33.0 [†]	100.0 [†]	100.0 [†]	25.0 [†]	29.0 [†]
	50 [‡] (34, 55)	14 [‡] (0, 25)	100 [‡] (100, 100)	89 [‡] (80, 100)	0 [‡] (0, 22)	0 [‡] (0, 14)
Protective foods						
Necessary to eat	91.8	89.3	87.9	77.6	69.4	76.8
fruit + veg daily?	96.2	85.5	100.0	98.8	79.0	75.6
Yes	4.4	-3.8	12.1	21.2	9.6	-1.2
	(-0.1, 8.9)	(-12.1, 4.5)	(6.2, 18.0)	(12.0, 30.4)	(-4.9, 24.1)	(-15.0, 12.6)

Table I. (continued)

Parameter	Intervention				Control	
	Heidedal N1=208 N2=208 % Initial % Second Diff. in % (95%CI)	Ritchie N1=122 N2=124 % Initial % Second Diff. in % (95%CI)	Jagersfontein N1=116 N2=96 % Initial % Second Diff. in % (95%CI)	Fauresmith N1=85 N2=85 % Initial % Second Diff. in % (95%CI)	Trompsburg N1=62 N2=81 % Initial % Second Diff. in % (95%CI)	Bethulie N1=69 N2=78 % Initial % Second Diff. in % (95%CI)
Can carrot & beetroot leaves be eaten?	66.3	21.3	97.4	94.1	54.8	65.2
Yes	(12.3, 28.1)	(47.5, 67.9)	(-3.6, 4.6)	(0.8, 10.2)	(13.0, 42.8)	(-7.0, 22.8)
Amount of water used for cooking vegetables	33.2	38.5	0.0	2.4	16.1	26.1
Just covers pot base	*	*	*	78.8	23.5	28.2
Days/week eat vegetables + fruit	*	*	*	76.4	7.4	2.1
Seven	(67.1, 85.7)	(-5.6, 20.4)	(-12.3, 6.5)	(44.2, 66.2)	(-7.7, 12.9)	(-15.5, 2.5)
Grow own veg?	57.2	6.6	0.9	2.4	9.7	11.6
Yes	75.0	28.2	*	57.6	12.3	5.1
	17.8	21.6	*	55.2	2.6	-6.5
	(8.9, 26.7)	(12.5, 30.7)		(37.1, 61.7)	(-1.6, 24.4)	
Energy foods	13.0	11.5	3.4	10.6	14.5	31.3
Bread usually used	23.6	55.6	*	60.0	25.9	*
Brown + whole grain (instead of white)	10.6	44.1	*	49.4	11.4	*
	(3.2, 18.0)	(33.7, 54.1)				
Necessary that meals include starch?	56.3	77.0	80.2	89.4	69.3	71.0
Yes	*	50.8	89.6	91.8	79.0	84.7
	*	-26.2	9.4	2.4	9.7	13.7
		(-37.7, -14.7)	(0.1, 18.9)	(-6.4, 11.2)	(-4.8, 24.2)	(0.3, 27.1)
Building foods	48.1	57.4	86.2	54.1	32.3	40.6
Legumes or meat healthiest?	75.5	46.8	91.7	88.2	58.0	56.4
Equally healthy	27.4	-10.6	5.5	34.1	25.7	15.8
Days/week eat legumes?	(18.4, 36.4)	(-23.0, 1.8)	(-2.9, 13.9)	(21.5, 46.7)	(9.9, 41.5)	(-0.2, 31.8)
Legumes or meat healthiest?	26.9	3.3	1.7	4.7	6.5	7.2
Equally healthy	74.0	44.4	*	55.3	28.4	23.1
Days/week eat legumes?	47.1	41.1	*	50.6	21.9	15.9
Equally healthy	(38.6, 55.6)	(31.8, 50.4)		(39.1, 62.1)	(10.3, 33.5)	(4.7, 27.1)
Days/week eat legumes?	1 ⁺	1 ⁺	1 ⁺	1 ⁺	1 ⁺	2 ⁺
Equally healthy	2 ⁺	2 ⁺	1 ⁺	1 ⁺	2 ⁺	2 ⁺
Days/week eat egg, meat, chicken, fish	0 [‡]	0 [‡]	0 [‡]	0 [‡]	0 [‡]	0 [‡]
Equally healthy	(0, 1)	(0, 0)	(0, 1)	(0, 0)	(0, 1)	(-1, 0)
Days/week eat egg, meat, chicken, fish	7 ⁺	4 ⁺	2 ⁺	2 ⁺	3 ⁺	3 ⁺
Equally healthy	7 ⁺	4 ⁺	4 ⁺	*	3 ⁺	3 ⁺
Days/week eat egg, meat, chicken, fish	0 [‡]	0 [‡]	1 [‡]	*	1 [‡]	0 [‡]
Equally healthy	(0, 0)	(0, 1)	(1, 2)		(0, 1)	(-1, 1)

Phrase below each parameter indicates the desirable response.

* Not reported because of unreliability.

⁺ Median.

[‡] Median difference.

convenience of coffee creamers in households where no refrigerator is available is the most likely reason for this. The low milk intake in our study concurs with that of other studies undertaken in South Africa among black schoolchildren.²⁸ It seems, however, that the problem of inadequate intake of milk and milk products is not only restricted to developing countries, but is a problem in other Western countries too.^{26,29} Regarding milk consumption, our results are in agreement with those of international researchers who found that more milk is consumed in urban than rural communities.³⁰ The median percentage of household members using more than two cups of milk per day improved significantly in intervention areas. In contrast to the intervention areas, the provision of milk powder as part of the food aid programme did not seem to have a major effect on the amount of milk used in control areas. By improving community awareness of the importance of milk through nutrition education, the consumption of milk can be increased, even in communities where resources are limited.

In the initial survey, most respondents knew that daily consumption of vegetables and fruit is necessary for good health. These results are similar to those of Walker *et al.*¹ who found that most housewives in their study knew that fruit and vegetables can protect against disease. Despite this, the percentage of respondents who knew that fruit and vegetables are essential improved significantly in two rural intervention areas where the nutrition advisor had advocated knowledge of protective foods. Knowledge about the use of carrot and beetroot leaves as a protective food improved in intervention areas, but also in control areas, which indicates that the improvement cannot only be ascribed to the NEIP. When asked how much water they used when cooking their vegetables, a large percentage of respondents either used enough water to cover half of the vegetables or completely submerged the vegetables. In the only intervention group included for this question, the percentage of persons who added only enough water to cover the base of the pot increased significantly. In the two control areas, however, very few respondents did so. As with milk intake, it has been found that more fruit and vegetables are consumed in urban than in rural communities.^{30,31} As found in other studies of deprived rural South Africans,³² fruit and vegetables were eaten only two or three times a week in most families included in our study. Although still not optimal, a marked and significant improvement was observed in three intervention areas, but not in control areas. Even among American adults only 23% meet the minimum goal of four protective foods per day.³³ The percentage of households that grew their own vegetables was disappointing in all areas, but improved in intervention areas. A close to significant improvement was seen in one control area. It is reported that simply improving knowledge of the recommended fruit and vegetable intake does not have a marked effect on the intake of protective foods.³³ For this reason the NEIP aimed at improving consumption through both

improved knowledge of protective foods, and addressing household food insecurity through community vegetable garden projects. In the initial survey of our study, a range of 3 - 31% of households had a vegetable garden, which is even lower than the 24% of respondents in the study of Ladzani *et al.*³⁴ The significant improvement in fruit and vegetable intake in intervention areas with the lowest median number of days that fruit and vegetables were eaten seems to correlate with the increase in the percentage of respondents who grew their own vegetables.

Regarding brown bread intake, similar results to ours have been reported in black rural communities, such as in the study of Ladzani *et al.*³⁴ where 86% of households ate brown bread. The improvement in the percentage of respondents that used brown bread and whole grain bread cannot be ascribed to the NEIP, since an improvement in brown bread intake was observed in a control area as well as in an intervention area. The fact that brown bread is cheaper than white bread would be a big consideration for unemployed families. The significant increase in the use of brown bread in two study areas could further be ascribed to the inclusion of brown bread flour in the food aid programme food parcels. Food parcels in Ritchie contained white bread flour. A large proportion of respondents initially considered it unnecessary to include a starch in each meal. Walker *et al.*¹ found similar results among housewives who considered carbohydrate-rich foods to be bad for their health. A large percentage of the general public believe that starch-containing foods, such as bread and potatoes, contain only energy and should be the first to be eliminated from the diet when trying to lose weight. Similar results have been found among low-income families in the USA.²⁷ Popkin³⁵ has highlighted the importance of addressing chronic diseases of lifestyle, such as obesity and high blood pressure, in developing countries that are adapting traditional food choices to more Western ones. After the NEIP, there was a significant improvement in the percentage of persons who knew that it is necessary to include a starch in each meal. The unexpected improvement observed in one of the control areas seems to indicate that there may be reasons for the improvement other than the NEIP.

In spite of the valuable protein available in legumes, the use of legumes as a complementary protein source was found to be low. This tendency was also found by Walker *et al.*,¹ who reported that the housewife respondents in their study mentioned meat, eggs and fish as the best sources of protein in the diet, without mention of legumes. In addition, Steyn *et al.*³¹ have reported that legume intake is low in rural coloured children in the Western Cape, which probably reflects the legume intake of the whole family. Furthermore, low legume intake among children from all ethnic groups in South Africa is also evident in a study reported by Mackeown *et al.*³⁶ Despite the inclusion of a dried legume, such as beans or lentils, in most food aid parcels that were distributed in both study and

control areas, a significant improvement in the median frequency of legume intake was not observed in any study areas. The median frequency of intake did, however, increase by 1 day a week in two study areas and in one control area. In the smaller rural areas legumes such as lentils and chickpeas are not sold in the local shops and dried beans are the only available legume. In addition, the cultural belief that legumes are inferior to protein sources derived from animals (which is partly true if not used in the correct combinations), has not yet been totally eliminated. The challenge remains to create ways of overcoming these obstacles in the communities where legumes are not well accepted.

In Heidedal, the median frequency of meat, fish, poultry and egg intake was much higher than in the rural areas. These results concur with those of other researchers who have reported that meat, fish and eggs are consumed more frequently in urban than rural communities.³⁰ The two rural intervention areas (Jagersfontein and Fauresmith) with the lowest median frequency of intake of these foods in the initial survey (a median of 2 days per week) improved significantly to 4 days per week. In contrast, the median frequency of meat, fish, chicken and egg consumption was the lowest in the control areas, which had not been exposed to the NEIP.

It is recommended that existing skills and good dietary practices in communities be identified and strengthened. Simultaneously, appropriate unconventional methods of nutrition instruction should be given priority in order to encourage community participation in the education process. Community structures such as women's groups, play groups and committees, could be established and utilised in the interests of nutrition education.

Nutrition education programmes based on the principles of the NEIP can make a meaningful contribution, both to addressing nutrition-related problems within communities, and simultaneously to encouraging community development through a process of involvement.

Further research in settings where nutrition education without food aid is implemented is required to determine the replicability of the NEIP. Furthermore, the evaluation of similar programmes over longer periods of time could present useful information on long-term benefits.

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