

East African Medical Journal Vol. 79 No. 7 July 2002

MISSED OPPORTUNITIES AND CARETAKER CONSTRAINTS TO CHILDHOOD VACCINATION IN A RURAL AREA IN UGANDA

F. Tugumisirize, MBChB, MMed, J.K. Tumwine, MBChB, MMed, FRSH, Ass. Professor and E.A. Mworzi, MBChB, MMed, Department of Paediatrics and Child Health, Makerere Medical School, P.O. Box 7072, Kampala, Uganda

Request for reprints to: Prof. J.K. Tumwine, Department of Paediatrics and Child Health, Makerere University Medical School, P.O. Box 7072, Kampala, Uganda

**MISSED OPPORTUNITIES AND CARETAKER CONSTRAINTS TO CHILDHOOD VACCINATION IN A RURAL AREA IN UGANDA**

F. TUGUMISIRIZE, J.K. TUMWINE and E.A. MWOROZI

**ABSTRACT**

**Background:** Despite concerted support to vaccination programmes, coverage remains low. While health service reasons for this are known, there is little information on caretaker constraints to vaccination in Africa.

**Objective:** To establish the prevalence of missed vaccination opportunities and caretaker constraints to childhood vaccinations.

**Design:** Cross-sectional descriptive study.

**Subjects:** Caretakers of 408 children aged 12-23 months were interviewed.

**Setting:** Kiyeyi, a rural area in Eastern Uganda.

**Results:** Complete vaccination coverage by card was 26.7% while by history and card it was 44.6%. Of the 215 eligible children who sought treatment in a health facility where vaccination could be offered, 59.6% missed an opportunity to be vaccinated while 24.4% of the children missed an opportunity during routine vaccination sessions. Reasons for non-completion of vaccination included caretaker 'not bothered', being busy, or ill and fear of rude health workers. While most caretakers were aware of vaccination and its benefits, none knew the immunisation schedule. The major caretaker constraints were low level of formal education, fear of vaccine side effects, and perceived contraindications to vaccinations.

**Conclusion:** Promotion of formal education for girls and educating mothers and health workers on the timing of vaccinations, their side effects and management might contribute to higher vaccination coverage.

**INTRODUCTION**

One of the most important medical developments in the 20th century was the control of common childhood infectious diseases by the administration of highly effective vaccines(1,2). In Uganda, it is estimated that one in every 12 children born does not live to celebrate the first birthday, and of those who survive their first year, one in every fourteen does not reach the fifth birthday(3). These deaths are largely attributable to serious illnesses(3), some of which can be prevented with correct health programmes, especially vaccination. In developed countries, the reported number of diphtheria, measles, mumps, pertussis, poliomyelitis, rubella and tetanus has declined by 97% or more(1). The eradication of small pox in 1977 and the near current eradication of poliomyelitis in the western hemisphere and southern part of Africa, further attest to the remarkable public health benefits of vaccination programmes(1,4).

In Uganda, the Expanded Programme on Immunization (EPI) implementation started actively in 1984, in nine districts. However due to political strife,

EPI did not perform well and in 1986, a survey revealed that the national vaccination coverage was very low at: 31 % for BCG, 19.1% for measles, 13% for DPT, 12.9% for polio, although this was a significant improvement over the 1980 figure of 1%. The current government(3) launched the accelerated EPI programme in 1986 with the aim of achieving 50% vaccination coverage among children aged 12-23 months(5) by 1990. By 1995 the programme had achieved some modest success. For example the 1995 Uganda Demographic and Health Survey revealed a complete vaccination coverage of 29%, a drop out rate of 31%, while 14% of the children had not received any vaccination by two years of age(3). Eastern Uganda registered a slightly higher complete vaccination coverage of 34.4% and a drop out rate of 15.1% by two years of age(3).

Although the complete vaccination coverage in Eastern Uganda was higher than the national vaccination coverage it was still far below the 90% vaccination coverage recommended by the World Health Organisation (WHO). Reasons for this low vaccination coverage remain largely unknown. However missed

vaccination opportunities might be playing a large role.

**Missed vaccination opportunities:** A missed vaccination opportunity is the failure of a health worker to administer any or all vaccines, for which the child was eligible, at the time of the visit(6).

Routine vaccinations often miss significant numbers of children who should be vaccinated. Within a year, many of those who miss will have consulted a health worker at a health facility for other needs. When they do, the health facility must be ready to screen and provide the missing vaccination doses(6).

Although reasons for low vaccination coverage have been studied in several countries and in some districts of Uganda, there is no information on the current caretaker constraints to vaccination of eligible children in Uganda. Therefore the aim of the study was to determine caretaker constraints to vaccination in Kiyeyi, a rural area in eastern Uganda.

The specific objectives were to determine vaccination coverage of children aged 12-23 months in Kiyeyi, establish the prevalence of missed vaccination opportunities, and determine the constraints and reasons for non-vaccination.

## MATERIALS AND METHODS

**Study type:** Cross sectional descriptive study.

**Study area:** Tororo district is located at the Kenya-Uganda boarder, 216 km east of the capital Kampala. Kiyeyi is located 32 km west of Tororo town and consists of 72 villages in eight parishes. Kiyeyi Health Centre offers both curative and preventive services, including out-patient services, under five clinics and reproductive health services. The health centre staff run under-five clinics once a month at outreach centres.

Kiyeyi has an estimated total population of 40,425 people of whom 27,810 (69%) are under 15 years of age and 18% are under five years of age(3).

**Study subjects:** All caretakers of children aged 12-23 months of age, residing within Kiyeyi.

**Inclusion Criteria:** All caretakers of children aged 12-23 months, resident within the study area at the time of the study.

**Exclusion Criteria:** Caretakers who did not consent.

**Sample Size:** Using the formula by Kish(7) and assuming the prevalence of non-vaccination(8) to be 15%, with an acceptable error of 0.05 and 95% confidence, the minimum sample size was calculated as 195. Considering a design effect of 2, due to cluster sampling method, the total sample size was adjusted to 390.

**Sampling procedure:** A modified cluster sampling method recommended by WHO(9) was used. This allows a small number of the target population to be sampled while providing data, which is statistically valid. Thirteen respondents per cluster were to be interviewed. All the villages in target area were listed and 30 villages (clusters) were selected by simple random sampling. In each cluster selected, the first household was identified by going to the middle of the cluster and randomly selecting the direction to be taken, using the tip of a pen. The direction was followed until the first household was identified.

Subsequent households were chosen by proximity until

eligible children were found. If the end of the village was reached before the required number was attained, the perimeter of the village was followed in a clockwise direction until the 13 eligible respondents were enrolled.

**Data collection:** The information collected included demographic data, the socio-economic and vaccination history of the children and possession of vaccination cards. Trained interviewers administered a questionnaire validated by the jury method(10), after informed consent was obtained. Medical records and a calendar of local events were developed with a social worker and were used to validate information whenever possible.

**Data management:** Completed forms were checked for accuracy and data was entered into the computer using the WHO/CDC Computer Programme Epidemiological Information (EPI-INFO)(11) and SPSS.

**Data analysis and statistical tests:** Means and standard deviations were determined for continuous variables, while frequencies and proportions were determined for categorical variables. The students' *t* and Chi squared tests were used to test for significance.

**Quality control:** Interviewers were trained in research methodology and practised with the questionnaires before carrying out the survey.

**Ethical considerations:** Permission to carry out the study was obtained from the Makerere University Faculty of Medicine Research Committee, the National Council for Science and Technology, the Tororo District Health Services, Kiyeyi Health Centre management committee, and the local village councils.

## RESULTS

**General:** Between November and December 1998, a total of 408 caretakers of children aged 12-23 months were interviewed.

**Vaccination coverage:** Of the 408 children, 258 (63.2%) had vaccination cards; an additional 73 (17.9%) had received at least one immunisation but could not produce a card. Vaccination coverage by card and history is shown in Table 1.

**Table 1**

*Vaccination coverage of children aged 12-23 months by card and history*

Antigen	Card No.(%)	History No. (%)	Total No. (%)
BCG	253 (62.0)	120 (29.4)	373 (91.4)
OPV1	233 (57.1)	125 (30.6)	358 (87.8)
OPV2	196 (48.0)	117 (28.7)	313 (76.7)
OPV3	156 (38.2)	110 (27.0)	266 (62.2)
DPT1	233 (57.1)	121 (29.7)	354 (86.8)
DPT2	191(46.8)	126 (30.9)	317 (77.7)
DPT3	151 (37.0)	118 (28.9)	269 (65.9)
MEASLES	134 (32.8)	71 (17.4)	205 (50.2)
ALL	109 (26.7)	73 (18.9)	182 (44.4)

Complete vaccination coverage by card was 26.7% and 44.6% by card/history.

*Background characteristics of caretakers:* Of the 408 caretakers, 92.6% were females and 7.4% males. The majority of the caretakers were Adhola (77.5%) by tribe while 17.6% were Banyole. More than half (57.1%) were Protestants, 37.7% were Catholics while the rest (3%) belonged to other religions. Almost all (96.8%) the household heads were male. Other demographic characteristics and relationship of the caretakers to the children are shown in Table 2.

*Background characteristics of the children:* Four hundred and eight children aged 12-23 months were recruited. The mean age of children who had completed the vaccination was 18.4 months (SD 3.9) while the mean age of those who had not completed the vaccination was 16.9 months (SD3.9). The difference was statistically significant ( $p = < 0.001$ ).

Other child demographic characteristics are shown in Table 3, none of which had a statistically significant relationship with completion of vaccinations.

The mean age of caretakers whose children had completed vaccination was 26.4 years ( $SD\pm 7.5$ ), while

that of the caretakers whose children had not completed vaccination was 24.9 years ( $SD\pm 6.7$ ), and the difference was statistically significant.

*Missed vaccination opportunities among children who were ill and eligible for vaccination:* In the two weeks prior to the survey, 387 (94.4%) children were ill. Of these, 215 (52.6%) were eligible for vaccination. Ninety-four (24.3%) of the eligible children were treated in a facility where vaccination could be offered. However, only 38 were effectively vaccinated and 58 (61.7%) of the 94 were assessed for vaccination, leaving thirty-six (38.3%) not assessed and not vaccinated.

Of the 58 who were assessed, 20(34.5%) were not vaccinated. Overall 56 (59.6%) of the 94 eligible children missed an opportunity to be vaccinated during a sick visit. Of those who were assessed and not vaccinated, 20 had fever, 12 had diarrhoea and seven had cough.

Some children had more than one disease entity. None of these children had a true contraindication to vaccination.

**Table 2**

*Vaccination coverage and background characteristics of caretakers of children aged 12-23 months in Kiyeyi, Tororo district*

	Vaccination Completed (%)	Vaccination Not Complete (%)	Total	P-value
Age (months)				
15-19	17(29.8)	40(70.2)	57	
20-24	70(45.2)	85(54.8)	155	0.022*
25-29	45(47.9)	49(5.1)	94	
30-34	30(48.4)	32(51.6)	62	
35-40	12(46.2)	14(53.8)	26	
>40	8(57.1)	6(42.9)	14	
Marital status				
Married	176(44.6)	219(53.4)	395	0.425
Single	6(46.2)	7(53.8)	13	
Education				
Nil	55(36.4)	96(63.6)	151	
P1-P4	31(37.8)	51(62.2)	82	0.003*
P5-P7	73(54.9)	60(45.1)	133	
Post Primary	25(56.8)	19(43.2)	44	
Relation to child				
Mother	164(43.6)	212(56.4)	376	
Father	7(38.9)	11(61.1)	18	0.843
Grand parent	4(66.7)	2(33.3)	6	
Others	7(87.5)	1(12.5)	8	

\*p-value is significant

*Missed vaccination opportunities during routine vaccination visits:* Of the 384 children who had attended vaccination sessions since birth, 94 (24.5%) had been refused vaccination by health workers at one time or another during routine vaccination sessions. Of those

who were refused vaccination by the health workers, the majority 61(64.9%) had not completed the vaccination schedule, and the difference was statistically significant (Table 4).

**Table 3**

*Vaccination by background characteristics of children aged 12-23 months in Kiyeyi-Tororo district, Uganda*

	Vaccinations Completed(%)	Vaccinations not Completed(%)	Total	P-value
Sex				
Male	85(43.6)	110(56.4)	195	0.688
Female	97(45.5)	116(54.5)	213	
Birth order				
1-2	72(45.0)	88(55.0)	160	0.479
3-4	49(40.8)	71(59.2)	120	
5 and above	61(47.7)	67(52.3)	128	
Number of under fives in the family				
One	60(46.2)	70(53.8)	130	0.678
Two	86(42.2)	118(57.8)	204	
Three	34(47.9)	37(52.1)	71	
Four	2(66.7)	1(33.3)	3	
Place of birth				
Home	141(43.3)	185(6.70)	326	0.323
Health centre	41(50.0)	41(50.0)	82	
Place of usual treatment*				
Vaccination facilities	147(41.8)	205(58.2)	352	0.322
No vaccination facilities	35(36.5)	61(63.5)	96	
Visited health facility before				
Yes	165(43.8)	212(56.2)	377	0.161
No	17(54.8)	14(45.20)	31	
Recurrent Illnesses				
Yes	110(47.2)	123(52.8)	233	0.208
No	72(41.1)	103(58.9)	175	

\*Some children are usually treated in more than one place

**Table 4**

*Missed opportunities on routine vaccination visits*

φ Refused vaccination by the health worker	Vaccination Complete (%)	Vaccination not completed (%)	Total (%)	p-value
Yes	33 (35.1)	61 (64.9)	94 (23)	0.035*
No	148 (47.4)	164 (52.6)	312 (77)	

φ Two caretakers were not sure if their children had been refused vaccination.

\*p-statistically significant.

The health workers refused most children vaccination because the children had fever (43.6%), measles (10.6%), diarrhoea (9.6%), cough (7.4%), or were told that vaccines were finished 3(3.2%). Only one child (1.1%) was very sick requiring admission.

*Reasons for non-completion of vaccinations:* The commonest reason given by the caretakers was that the caretaker was "reluctant" accounting for 53 (31.4%). Other factors contributing to non-completion of vaccination are shown in Table 5.

Three hundred and thirty caretakers had witnessed a side effect in their children after vaccination. Of these 330, only 67(20.3%) did not go back to the vaccination centre after witnessing the side.

Caretakers who did not take their children after witnessing the side effects were more likely to have children who had not completed vaccination than those

who took back their children for vaccination despite the side effects ( $p = < 0.001$ ).

*Reasons for not starting vaccination in children aged 12-23 months in Kiyeyi:* Twenty-four (5.9%) children were not vaccinated at all for various reasons. Four had not been vaccinated because their caretakers believed that vaccines were dangerous. Most of the caretakers, 401 (98.3%) had heard about vaccination. Of those who had heard about vaccination only 30.3% knew at least 3 or more vaccine preventable diseases. Polio and measles were known by 77.7% and 72.5% respectively. Very few caretakers mentioned diphtheria and pertussis 17.4% and 10.8% respectively. There was no significant association between completion of vaccination and knowing at least three or more vaccine preventable diseases ( $p$ -value = 0.707).

**Table 5**

*Other factors contributing to non-completion of vaccinations in children aged 12-23 months*

	Vaccinations completed(%)	Vaccinations not completed(%)	P-value
Side effects to vaccines			
Yes	157 (47.6)	173 (52.4)	
No	25 (32.1)	53 (67.9)	0.011*
Went back after witnessing side effects			
Yes	166 (9.1)	172 (50.9)	
No	14 (20.9)	53 (79.1)	< 0.001*
Distance (km)			
0 - 2	112 (47.1)	126 (52.9)	
3 - 5	44 (41.5)	62 (58.5)	0.630
6 and more	19 (46.30)	22 (53.7)	
Did not know	7 (30.4)	16 (69.6)	
Mode of transport			
Foot	166 (49.1)	172 (50.9)	
Others	16 (22.9)	54 (77.1)	< 0.001
Walking time (hours)			
1 - 2	122 (48.2)	131 (51.8)	
2.01 - 3	44 (41.1)	63 (58.9)	0.099
3.01 and more	16 (33.3)	32 (66.70)	
Number of children to take along			
1	148(43.6)	191 (56.4)	0.175
2 or more	34 (49.3)	35 (50.7)	
Vaccine facility			
Outreach	76 (53.9)	65 (46.1)	
Fixed	106 (39.7)	161 (60.3)	0.024*
Pay for vaccines			
Yes	138(47.8)	151 (52.2)	
No	44(37.0)	75 (63.0)	0.086

\*p-significant

*Caretakers' knowledge about the national immunization schedule:* Of the 381 caretakers only 44 (11.5%) knew the correct number of BCG, OPV, DPT and measles doses. Three hundred and thirty-seven (88.5%) could mention some but did not know the whole schedule. Three hundred and forty-two (83.8%) of the mothers knew the correct age for BCG, while two hundred and seven (54%) knew the age for measles vaccine. The least known ages were for DPT3 and OPV3.

*Caretaker's knowledge about vaccination and completion of vaccination in their children aged 12-23 months:* One hundred and ninety two caretakers were aware of contraindications to vaccination. The contraindications mentioned included fever 124 (64.6%), diarrhoea 12 (6.3%) and cough 10 (5.2%).

One hundred and nineteen (62%) children whose caretakers knew contraindications to vaccination had not completed the childhood vaccinations compared to 50% of the 216 children whose caretakers did not know contraindications to vaccination ( $p = 0.013$ ).

## DISCUSSION

The main objective of this study was to determine caretaker constraints to vaccination of children in Kiyeyi in Tororo district. Specifically the study sought to determine the vaccination coverage, the prevalence of missed vaccination opportunities, and establish the reasons for non-vaccination among children aged 12-23 months.

*Vaccination coverage:* The vaccination coverage in Kiyeyi was higher than that of eastern Uganda(3), but lower than the Uganda national coverage(3) and that of other African countries(12,13).

*Coverage by antigen and drop out rate:* Despite a high BCG coverage, almost a third of the children with documented BCG vaccination had no scar. This could be due to wrong technique, primary vaccine failure or a break in the cold chain. The drop out rate between BCG and measles was higher than the national(3) and that of Kampala(14), but lower than that of Tororo district. This high drop out rate between BCG and measles is of concern, and could be due to the wide spread belief, among both the community and health workers in Kiyeyi, that sacrifices to spirits is superior to measles vaccination. It could also be due to the long interval between BCG and measles vaccination.

*Vaccination coverage by background characteristics of the caretakers:* The small number of male respondents could be due to the fact that the men were either working away from home(15), or if they were present, they preferred the women to answer questions on vaccination of their children. Despite these differences, however, the gender marital status, occupation, and ethnic background of the caretakers had no statistically significant relationship to complete vaccination coverage.

This is in conformity with results of similar studies done in Uganda(15).

Amongst the children whose caretakers had at least five years of formal education, 55% had completed their vaccination schedule compared to only 37% of the children whose caretakers had less than five years of formal education ( $p < 0.001$ ). This finding is similar to that of other researchers(12-15). It is possible that education status of the caretaker impacts on the vaccination of her child through greater awareness of appropriate health practices(12), health facility utilisation, and greater involvement in decisions regarding health care(16). The mother's education might also act through her ability to accept new ideas, and having higher confidence in dealing with health professionals(17).

*Age of caretaker:* In the current study, the age of the caretaker significantly affected the vaccination status of the children ( $p=0.022$ ). This is in agreement with other studies where teenage mothers and caretakers over 40 years of age were more likely to have their children lagging in their vaccinations(8,18-20).

*Gender:* There was no difference in the vaccination status with respect to sex ( $p = 0.688$ ) or birth order ( $p = 0.479$ ) of the child. These findings are in agreement with other studies done in Uganda(18). However in one Ugandan study(3), male children and those of birth order greater than 4, were more likely to have completed the vaccinations.

*Recurrent illnesses in the child:* The majority of the caretakers were of the opinion that a child suffering from fever or diarrhoea should not be vaccinated. Similar opinions were voiced in the group discussions. Sixty-two percent of the children whose caretakers held these views had not completed vaccination. This is similar to findings of other studies in which caretakers mentioned illnesses in the child as a major reason for failing to complete the vaccination schedule(6,21-24).

Just over half the children were reported to have a recurrent illness, the commonest being fever, diarrhoea and cough which are similar to the diseases mentioned as common childhood illness during focus group discussions. Although most health workers regard recurrent diseases as contraindications to childhood vaccinations(1,6,21), in this survey recurrent illnesses did not significantly affect completion of vaccinations ( $p = 0.208$ ).

*Vaccination coverage and missed vaccination opportunities:* Opportunities to vaccinate children are usually missed when eligible children attend a health facility for other health needs(6,20,21). In this study almost a quarter of the children who were ill in the two weeks prior to the survey, were eligible for vaccination and were treated in a centre where vaccination could be offered.

However, 38% were neither assessed nor vaccinated. Of these two thirds were vaccinated. Sixty per cent of the eligible children had missed a vaccination opportunity during a sick visit. These children had

fever, cough and diarrhoea which conditions are usually quoted as false contraindications to vaccinations(9,10, 28-29).

Almost a quarter of the caretakers reported that their children had been refused vaccination during visits for routine vaccination, hence leading to a missed vaccination opportunity. The reasons given were that the child had fever, diarrhoea or measles. In the current study, of the 94 who had been refused vaccination, only thirty five per cent had completed the vaccination schedule by the time of the study. Hence, being turned away from vaccination had significantly affected the completion of vaccination.

Other studies have also found that missed vaccination opportunities affected completion of childhood vaccination(15,21,25,26). Reasons given for refusing to vaccinate the children were fever, cough and diarrhoea which were similar to those reported in other studies(21,25,27).

*Reasons for not completing vaccination:* Caretaker reasons for non-completion of vaccination included fear of rebuke from health workers and illness of the caretaker. Similar reasons have been reported elsewhere(12,15,22). In other studies(15,22) competing priorities on caretakers' time (caretaker being busy) was reported to be significant whereas in the current study, it was not.

*Low motivation:* In this survey, the term "low motivation" was used when caretakers reported that they were just "not bothered" or did not care. Thirty one percent were reluctant and a third lacked concern for the health of their children. Low motivation accounted for 31% of the reasons for not completing childhood vaccination.

Other reasons given for not completing vaccinations included caretakers being unconvinced about the importance of vaccines and belief in other ways of preventing the six childhood killer diseases like sacrifices to the spirits, prayers and herbs. Similar findings have been reported in other studies in Uganda and other countries(22,23,28).

*Health consequences:* This study has shown that, even though caretakers regard side effects as a major constraint to childhood vaccination, most health workers do not, as has been reported elsewhere(13,23,29). The other reasons mentioned included the fear that the vaccine might be laced with the human immunodeficiency virus (HIV), and that vaccines could kill, or make children lame or regress in milestones(22). Other studies have documented economic constraints as a contribution to low vaccination coverage (14,22). In this survey, waiting time and convenience of the sessions were not significant constraints unlike in other studies(14,15,22).

*Knowledge of the Uganda immunisation schedule by the caretakers:* Seventy percent of all the caretakers had received health education and said they had been taught about the vaccine preventable diseases.

However, only 2% had been taught about side effects and none mentioned the immunisation schedule. However, the majority of the caretakers did not know the doses and ages when the various antigens should be given: a finding consistent with another Uganda study(15).

## CONCLUSION

In conclusion, complete vaccination coverage in Kiyeyi was still low with a high rate of missed vaccination opportunities. Reasons for non-completion of vaccination included caretaker 'not bothered', being busy, or ill and fear of rude health workers. While most caretakers were aware of vaccination and its benefits, none knew the immunization schedule. The major caretaker constraints were low level of formal education, fear of vaccine side effects, and perceived contraindications to vaccinations.

Promotion of formal education for girls and educating mothers and health workers on the timing of vaccinations, their side effects and management might contribute to higher vaccination coverage.

## REFERENCES

1. Georges, P. Childhood immunizations. *New England J. Med.* 1992; **17**: 1794-1799.
2. United Nations Children's Fund. The State of the World's children, 1999 New York: UNICEF. 1999: 1-18.
3. Uganda Demographic and health survey (UDHS) 1995. Ministry of Finance and Economic Development. 1995: 112-116.
4. Bele, O. and Barakamfitye, D.G. The EPI in the WHO African Region: current situation and implementation constraints. *Sante.* 1994; **4**: 137-142
5. The Uganda National Expanded Programme on Immunisation: Plan of action 1987-1989. UNEPI Publication; 1987
6. Clements, J. Opportunities to immunise: *Child health dialogue.* 1996; **2**: 3-4.
7. Kish, L. Survey sampling John Wiley & Sons, New York. 1965; 35-70.
8. Uganda Demographic Health Survey (UDHS) 1989. Ministry Of Finance and Economic Development, Statistics Department, Entebbe, 1989.
9. Henderson, R.H. and Sundareson, T. Cluster sampling to assess immunisation coverage; a review of experience with a simplified sampling method. *Bulletin WHO.* 1982; **60**: 253-260.
10. Ugwegbute, A.C. Weaning practices and weaning foods of the Hausa, Yorubas and Ibos of Nigeria. *Ecol. Food Nutr.* 1991; **26**: 139-153.
11. Dean, A.G., Dean, J.A., Coulombier, D., et al. Epi-Info, Version 6.0: A word processing, database and statistical programme for public health on IBM compatible microcomputers. Centres for Disease Research and Prevention (CDC), Atlanta, Georgia USA. 1997: 1-20.
12. Zimbabwe Demographic health survey; central statistical office. Ministry of Finance, Economic Planning and Development. 1988; 85-89.
13. Namibia Demographic and Health Survey. Ministry of Health and Social Services. 1992; 98-105.
14. Weeks-R. M., Barenzi-J. F. Z., Wayira-J. R. M. A low cost community based measles outbreak investigation with

- follow-up action in Kampala. *Bull World Health*. 1992; **70**:317-321.
15. Kekitiinwa, A.L.M. The expanded programme on immunisation and factors influencing its success in Kasangati defined area: Dissertation for Postgraduate M.Med. Paediatrics, Makerere University. 1987; 1-43.
  16. Radebe, B.Z., Brady, J.P., Siziya, S. and Todd, H. Maternal risk factors for childhood malnutrition in Mazowe district of Zimbabwe. *Central Afri. J. Medicine*. 1996; **42**: 240-249.
  17. Vella V., Tomkins A. and Ndiku, J. Determinants of nutritional status in western Uganda. *J. Trop. Pediat*. 1995; **41**: 89-98
  18. Razum, O. Mothers voice their opinion on immunisation services. *World Health Forum*. 1993; **14**: 282-286.
  19. Dyer, J.J. Missed opportunities for immunisation in Natal health facilities. *S. Afr. Med*. 1993; **83**: 577-579.
  20. Cutts, F.T., Zeln, Er, Soares, A.C. and Diallo, S. Obstacles to achieving immunisation for all 2000: missed immunisation opportunities and inappropriately timed immunisation. *J. Trop. Pediat*. 1991; **31**: 153-159.
  21. Khan, J.G., Mokdad, A.H., Deming, M.S., Rougou, J.B., Boby, A.M., Excler J.L. and Waldman, R.J. Avoiding missed opportunities for immunisation in the Central African Republic. Potential Impact on vaccination coverage. *Bull World Health Organisation*. 1995; **73**: 47-55.
  22. Coreil, J., Augustin, A., Halsey, N.A. and Holf, E. Social and psychosocial costs of preventive child health services in Haiti. *Soc. Sci. Med*. 1994; **38**: 231-8.
  23. New, S.J. and Senior, M.L. "I do not believe in needles". Qualitative aspects of a study into the uptake of infant immunisation in two English health authorities. *Soc. Sci. Med*. 1991; **33**: 509-518.
  24. Loevinsohn-B. P; Garcaballah-E Missed opportunities for immunisation during visits for curative care. A randomised cross-over trial in Sudan. *Bull World Health Organisation*. 1992; **70**: 335-359.
  25. Dammann, D.F. and Solarsh, G.G. The use of COSAS in the analysis of vaccination coverage in urban, peri-urban and rural population in the Endendale Nulidlela district of Kwazulu. *S. Afr. Med. J*. 1992; **84**: 150-154.
  26. Hutchins, S.S., Jansein, I.I.A., Robertson, S.E., Evans, P. and Kim-Farley, R.J. Studies of missed opportunities for immunisation in developing and industrialised countries. *Bull. World Health Organisation*. 1993; **71**: 549-560.
  27. Wood, D., Pereyra, M., Halfon, N., Hamlin, J. and Grabowsky, M. Vaccination levels in Los Angeles Public health centres: The contribution of missed opportunities to vaccinate and other factors. *Amer. J. Public Health*. 1995; **85**: 850-853.
  28. Tumwine, J.K. Measles in Chimanimani Zimbabwe. *East Afr. Med. J*. 1989; **66**: 531-534.
  29. Uganda National Programme of Immunization. *Quarterly News*. 1998; **1**: 1-5.

### EAMJ INTERNET ADDRESS

The East African Medical Journal is now available online as well as in print. Subscribers and readers interested in viewing the Internet version may access it using the following address: <http://www.bioline.org.br>

The Online version is distributed by the non-profit service; Bioline Publications, a South/North partnership whose aim is to facilitate global access to bioscience and medical research publications, with emphasis on journals published in the developing world.

Subscription to the online version may be made by completing the Registration form available from the Bioline home page (<http://www.bioline.org.br>). Readers may take out an annual subscription or purchase single documents. Abstracts are available without registration and free of charge.