COMMUNITY KNOWLEDGES AND PERCEPTION RATINGS OF ENVIRONMENTAL DETERMINANTS OF THE INCIDENCES OF OCCURANCES OF UNSTABLE MALARIA IN KERICHO COUNTY, KENYA

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Abstract

This study was conducted in Kericho county to represent malaria epidemic prone highlands in western Kenya highlands where incidences of unstable(epidemic) malaria burdens have reemerged and on increasing trend and assuming seasonal patterns of occurrences yearly since 1940s and a leading health burden in Kenya in the 21st century. The purpose of the study was to assess communities' knowledges of the disease and their perception ratings of the listed 39 environmental determinants in questionnaire administered to a sample of 300 household heads purposively chosen from Central Bureau of Statistics estimated at 98678 households in 1999.The respondents were asked to provide information regarding their knowledges of malaria and their perception ratings of significant environmental determinants attributable to the reemergence of occurrences of malaria burdens in their communities.Information obtained was analyzed using Factor Analysis(FA).Majority (75%) of respondents rated malaria as a serious problem in their communities and their knowledges of the disease was based on their own experiences at their household levels and they obtained the information about the disease from radio as the main media. FA classified and ranked in order environmental variables into 3 groups of factors (i) poor accessibility, unaffordability and incorrect use of anti-malarial drugs(ii) social-cultural and household behavioural patterns and(iii) rapid population growth and low Government's role in management and control of malaria, these accounting for 21.192%,14.083% and 2.924% respectively of the variance in the 39 variables attributable to occurrences of malaria, the first factor accounting for 89% of the variance of all variables. This suggests that malaria knowledges and awareness, subsidy of malaria medication cost by Local and Central Governments, improvements of accessibility to low costs health facilities should be stepped up in the county so that Kenya Government Vision 2030 and beyond Millinium Development Goals can be realized .

Key words: Community knowledges, Perception Ratings, Environmental Determinants, Unstable Malaria, Burdens, County,Kericho, Kenya.

1. Introduction

Globally malaria continue and remains in the 21st century the most important and a leading waterborne disease in tropical developing countries of the world in terms of the number of people infected, their reduced working capacity and mortality resulting from the disease estimated by WHO (2001) at least 650 000 cases annualy and a range between 400 to 500 cases and resulting in estimated death toll range of between 2 to 3 million cases annually (WHO, 2001; Lieshout *et al.* 2004;). of which more than 1 million deaths occur in Africa mostly children of less than 5 years old and Sub-Saharan Africa (SSA) accounting for 90% of Africa's malaria death toll which deprives Africa an annual estimated 12 billion United States of America Dollars in the lost Gross Domestic Product (Goodman *et al*.2000; Sachs and Malaney, 2002; Greenwood, 2004; WHO, 2003).
The component of malaria burden includes morbidity, mortality, still births, abortions and anemia in non-immune individuals in tropical developing countries (Giles 1995; Lieshout *at al.* 2004). Malaria is transmitted to humans by pathogen infected in *Anopheles (An)* Mosquitoes, *An. Gambiae, An. Funestus and An. Pharoensis* and *An. Gambiae* is the most widely spread transmitter of Malaria in Kenya *(Coetze et al.,* 1999*).*

The increase in incidences of occurrences of malaria in SSA is due to suitable climatic conditions, political instability, poverty, poor accessibility to low cost health facilities, ineffectiveness of health system in malaria control at district level, peoples' perceptions, beliefs and knowledges of the disease (Okenu, 1999;Githeko and Ndegwa, 2001; Sachs and Malaney 2002, WHO, 2003; Lieshout *et al*, 2004; Tonui, 2010).

Unstable (epidemic) malaria cases have been reported in the highlands situated at attitude of 1600m-3000 meters Above Sea Level (AsL) and Arid and Semi- Arid areas of the horn of Africa and incidences in Kenya highlands situated at attitude ranging between 1600m – 3000m AsL and in the Semi Arid areas of North Eastern Kenya and incideces of occurrences have been on increasing trend and assuming seasonal patterns of occurrences annually (Garnham, 1945; Fogh et *al el*., 1979; Githeko and Ndegwa, 2001; Hay *et al.,* 2002, GOK, 2001-2010; *Tonui et al., 2013*)

In 2001 Government of Kenya (GOK) declared 15 districts in western Kenya highlands to include :- Tranzoia, Kakamega, Vihiga, Kisii, Uasin Gishu, Transmara, Narok, Bomet, Nandi and Kericho as malaria epidemic prone areas and requiring attention regarding its control and management is in line with the National Malaria Control Strategy (NMCS) of 2001-2010 and GOK vision 2030 and beyond regarding poverty reduction. There is therefore a need to assess community knowledges of malaria and their perceptions ratings of environmental determinants at attributed to the occurrences of the disease at household and community levels so that so it controls and management can be addressed.

As a component of malaria control and management strategy al local level the objective of this study therefore was to assess community's knowledges and perception ratings of environmental determinants attributable to the occurrences of malaria in Kericho county classified by GOK in 2001 as malaria epidemic prone County in Western Kenya Highlands and requiring priority in Malaria Control programs.

2.Material and methods

2.1 Study area

The study was conducted in Kericho district in SSA to represent Kericho County and a subset of 15 districts in western Kenya highlands classified by GOK in 2001 as malaria epidemic prone district (MOH, 2001) is located between longitudes 35^{o} 02'and 35^{0} 40'E and between latitudes 0^{0} and 0^{0} 23'S and covered an area of 2110.6 $Km^{2}$and purposely the study, targeted the 7 administrative divisions Ainamost, Belgut, Chilchila, Kipkelion, Londiani, Soin and Sigowet (CBS, 2001) to represented Kericho County.

Kericho county lies at an altitude of 1600-3000m AsL which characterises it as epidemic (unstable) malaria prone highland area where fatal cases of malaria cases have reemerged and patterns and trends of malaria burdens have been on the increase since 1940s, through 1960s to 1980s and in the 21^{st} century and have assumed seasonal patterns of occurrences yearly and blamed on suitable environmental conditions particularly local climatic change particularly local temperature rise and peoples' beliefs, perceptions and knowledges of the disease which influence transmission of malaria among population with little acquired immunity (Gamham 1945;Fogh *et al*.,1979 Lindsay, 1998; Some, 1994; Hay *et al*., 2002; Shanks *et al,*.2005; Tonui, 2010).

Kericho county is endowed with rich fertile loam and clay soils, good rainfall distribution (range 157 – 250mm)and monthly temperature (range 16.8^{0} C – 18.6^{0} C) is a relatively rich county that supports both small and large scale tea plantations, horticulture, coffee, pyrethrum, sugar cane, vegetable as well as livestock keeping (KDPP 1997 – 20001; Tonui,2008)
The estimated population in the seven administrative divisions in the county in 1999 was 456768 (CBS, 2001); and the main language spoken is Kalenjin. Kiswahili and English are also spoken in the county and traditional African and Christian religions. among others are widely practiced in the County (KHDS, 1998); KDPP, 1997 – 20001)

2.2 Data types, sources, methods of data collection and samping procedure

Qualitative data on communities knowledges of malaria and their perception ratings of significant environmental factors attributable to incidences of occurrences of (unstable) epidemic malaria were collected from household heads (respondents) in administrative divisions of Kericho county purposively chosen to represent epidemic malaria prone district in western Kenya highlands.
The estimated population of 456768 residing and distributed in 98867 household (CBS 2001) in the county's 7 administrative divisions in the county in 1999 formed the target population. Purposely the 7 divistions were chosen to represent the county. Using stratified and random to sampling, the 300 purposely chosen households from 98867 households were apportioned to the divisions according to their respective number of households out of the total households in the county. The household heads formed the respondents who provided information on their knowledges of malaria and their perception ratings of a list of 39 enviromental determinants (Table 1) provided in the questionnaire as attributable to incidences of reemerging incidances of occurances of unstable malaria.

2.3 Data analysis, results and discussions

Information obtained from respondents (n=219) regarding their knowleges of malaria and their perception ratings of 39 environmental determinants (Table 1) were asked to rank the perceived causes of (epidemic) malaria in Kericho county and information provided was analyzed using Factor Analysis (FA).

The ranking was based on 5-point scale; very important (10), important (8), Fairly important (6) ,Less important(4),Least important (2). The first step in the analysis of significant factors perceived by respondents of malaria involved the presentation Table 1 showing total scores.

Table 1. Perceived ratings of environmental determinants of incidences of occurrences of unstable malaria (sample, n=219)

No	Variable (Factor)	Very important	Important	Fairly important	Less important	Least important
V1	Lack of appropriate use of anti-malaria drugs	108	47	22	10	3
V2	Lack of knowledges of malaria	87	47	22	17	12
V3	Lack of knowledges of physical environment causes of malaria	104	34	30	20	4
V4	Lack of malaria control funding by government	62	46	39	18	18
V5	Poor roads to low cost health centers	62	30	27	24	40
V6	Lack of rural anti-malaria education programs	113	45	19	7	3
V7	Lack of general accessibility to health facilities	54	66	39	20	9
V8	Long distance to low cost health facility	62	38	34	28	21
V9	Lack of malaria personnel in rural areas	89	44	20	11	13
V10	Lack of prompt medical treatment of malaria	115	46	13	5	9
V11	Lack of diagnostic kits for malaria detection	59	42	40	28	13
V12	Lack of use of local herbs for malaria treatment and medication	17	23	35	46	61

V13	Low education standards in households	52	41	44	26	23
V14	Uncleared bushy vegetation	64	35	36	20	23
V15	High temperature after long night rainfall	34	22	49	38	47
V16	Lack of use of ITNs	65	36	34	22	15
V17	Lack of money to purchase ITNs	67	36	22	19	26
V18	Crowded sleeping rooms	23	15	35	38	71
V19	High rates of migration of people to and from malaria endemic areas	19	27	34	46	61
V20	Lack of appropriate sources of anti-malaria drug	80	49	22	13	9
V21	Lack of malaria information from Ministry of Health	57	43	36	21	19
V22	High level of poverty in households	72	30	37	17	31
V23	Lack of knowledges and of new anti-malaria types and their use	95	36	21	7	8
V24	High population density-crowding	23	39	33	38	48
V25	Poor nutritional habits in households	33	44	24	36	33
V26	Lack of political will by government	30	34	37	35	47
V27	Inefficient low cost health facility personnel	67	37	38	22	10
V28	Unaffordable anti-malaria drugs in low cost health facilities	87	37	19	13	17
V29	Lack of consultation from a qualified health personnel in the health centers	78	40	21	11	05
V30	Lack of appropriate sourcing and policy guidelines of anti-malaria drugs	57	64	24	15	4
V31	Role of kiosks and shops	19	11	22	40	59
V32	House types	13	12	33	38	71

V33	Effect of HIV/AIDS	71	16	21	29	25
V34	Lack of serious malaria education schools	71	34	23	17	9
V35	Lots of pools of stagnant water	81	27	20	12	14
V36	Presence of many used plastic material scattered in many places	82	20	24	13	16
V37	Worships/devil worship, witchcraft etc	6	08	8	16	107
V38	Lack of free supply of ITNs and prophylactic medication for children and expectant mothers.	79	36	18	13	6
V39	Reemergence of anti-malaria drug resistance by malaria parasites	67	41	24	13	6

The results depicted in Table 1 are in total scores for each variable on the specified rating scales; the variable with the highest score is 115 followed by 113, 108, 104, and 95 in order. On the scale of important (8), the variable with the highest score is 66 and the variable with the lowest score on this scale is (6). On the fairly important scale the variable with the highest score is 49, and the lowest on this scale is the variable 8. On the least important scale variable V37 and V6 have scores of 107 and 3, the highest and the lowest scores respectfully. From Table 1 above it is not easy to quickly to group significant factors attributable to cause incidences of malaria thus the second step to determine this was to calculate zero correction coefficient among factors (variables)as depicted in Table 2.

Table 2: Zero correlation matrix of perceived environmental determinants attributable to cause incidences of occurrences of malaria.

	V_1	V_2	V_3	V_4	V_5	V_6	V_7	V_8	V_9	V_{10}	V_{11}	V_{12}	V_{13}	V_{14}	V_{15}	V_{16}	V_{17}	V_{18}	V_{19}	V_{20}
V_1	1																			
V_2	.99	1																		
V_3	.98	.96	1																	
V_4	.93	.92	.89	1																
V_5	.80	.79	.80	.63	1															
V_6	.99	.99	.98	.92	.83	1														
V_7	.72	.74	.62	.87	.23	.69	1													
V_8	.99	.97	.99	.93	.75	.98	.72	1												
V_9	.99	.99	.96	.92	.83	.99	.71	.97	1											
V_{10}	.99	.99	.96	.89	.86	.99	.66	.96	.99	1										
V_{11}	.90	.89	.91	.95	.50	.88	.84	.95	.86	.84	1									

V_{12}	-86	-86	-82	-94	-39	-83	-95	-88	-83	-08	-97	1								
V_{13}	.85	.82	.84	.97	.50	.83	.83	.89	.81	.78	.96	-92	1							
V_{14}	.96	.94	.97	.94	.82	.97	.66	.97	.96	.95	.89	-81	.90	1						
V_{15}	-49	-56	-35	-48	-11	-47	-75	-43	-51	-48	-47	.65	-32	-28	1					
V_{16}	.98	.96	.98	.95	.73	.97	.73	.99	.96	.95	.89	-81	.92	.98	-39	1				
V_{17}	.97	.97	.93	.85	.91	.98	.59	.92	.98	.99	.77	-72	.72	.93	-43	.91	1			
V_{18}	-65	-.66	-.60	-.75	-.07	-.61	-.92	-.69	-.60	-.56	-.85	.93	-.76	-.56	.74	-.69	-.46	1		
V19	-.85	-.85	-.83	-.94	-.39	-.83	-.92	-.89	-.82	-.78	-.98	-.99	-.94	-.83	.58	-.90	-.70	.92	1	
V20	.99	.99	.94	.95	.74	.98	.80	.96	.99	.98	.90	-.90	.85	.93	.60	.96	.95	-.71	-.88	1
V21	.95	.94	.91	.99	.63	.93	.87	.95	.93	.91	.96	-.95	.96	.95	-.51	.96	.86	-.77	-.95	.95
V22	.90	.87	0.91	.84	.92	.91	.46	.89	.90	.91	.75	-.63	.79	.96	-.09	.90	.92	-.32	-.65	.84
V23	.99	.99	.98	.92	.85	.99	.66	.98	.99	.99	.87	-.81	.83	.98	-.41	.97	.98	-.57	-.81	.97
V24	-84	-.81	-.92	-.82	-.54	-.83	-.59	-.92	-.78	-.93	.82	-.87	-.87	.20	-.93	-.72	.68	.86	.90	-.79
V25	.13	.21	-.03	.05	-.05	.12	.37	.03	.17	.16	.01	-.21	-.15	-.11	-.88	-.03	.15	-.35	-.12	.24
V26	-.75	-.75	-.77	-.74	-.25	-.73	-.76	-.81	-.67	-.67	-.90	.90	-.75	-.66	.60	-.80	-.58	.92	-.76	-.76
V27	.95	.93	.96	.95	.64	.94	.76	.98	.92	.90	.98	-.92	.95	.96	-.38	.99	.85	-.47	-.88	.93
V28	.99	.98	.97	.88	.89	.99	.62	.96	.99	.99	.82	-.77	.77	.95	-.43	.94	.99	-.52	-.90	.96
V29	.99	.99	.97	.95	.77	.99	.76	.99	.99	.98	-.87	-.89	.87	.96	-.53	.98	.96	-.69	.94	.99
V30	.81	.83	.70	.88	.38	.79	.97	.78	.81	.77	-.91	-.94	.79	.71	-.83	.78	.96	-.89	.94	.88
V31	-.64	-.65	-.59	-.82	-.09	-.61	-.96	-.69	-.60	-.55	.62	.94	-.86	-.62	.62	-.71	-.46	.96	.96	-.71
V32	-.75	-.96	-.71	-.83	-.20	-.72	-.93	-.78	-.71	-.67	.92	.97	-.82	-.67	.72	-.78	-.58	.99	-.48	-.80
V33	.82	.80	.89	.60	.89	.84	.20	.82	.81	.84	.83	-.46	.53	.81	-.09	.79	.86	-.22	-.86	.73
V34	.99	.99	.99	.92	.79	.99	.70	.99	.99	.98	.79	-.86	.85	.96	-.47	.99	.95	-.66	-.74	.98
V35	.98	.96	.98	.86	.90	.98	.56	.96	.98	.98	.83	-.74	.78	-.33	.95	.95	.98	-.48	-.69	.94

V36	.94	.92	.97	.82	.91	.95	.47	.94	.93	.95	.97	-.67	.96	-.19	.93	.93	.95	-.40	.84	.88
V37	-.51	-.50	-.55	.62	.07	-.48	-.73	-.61	-.44	-.40	-.81	.82	-.71	-.47	.47	-.62	-.29	.92	.84	-.54
V38	.99	.99	.98	.92	.80	.99	.70	.99	.99	.99	.90	-.85	.83	.96	-.50	.97	.97	-.65	.84	.98
V39	.99	.99	.95	.97	.70	.98	.83	.98	.98	.96	.94	-.93	.90	.95	.57	.98	.92	-.75	-.92	.99

From correlation matrix (Table 2) the correlation among the variables is generally high and some with set of generally high and some with low correlation, thus the need to classify variables into groups of related factors. Classification of variables into groups of related factors was obtained by varimax rotation (Table 3) which yielded 4 important factors. These factors were determined using nature of eigen values and factor scree plot technique (Figure 1). The varimax rotation retained only those factors (variables) with an Eigen value of 1 and above. This is because those factors with eigen values less than one are significant i.e. their contribution to the overall explanation of the cause of occurrence of malaria is low.

Table 3: Loadings of rotated factor matrix.

Rotated Loading Matrix (VARIMAX, Gamma = 1.0000)

Variable(V)	**1**	**2**	**3**
V1	0.867	0.474	0.152
V2	0.853	0.467	0.230
V3	0.874	0.468	- 0.022
V4	0.701	0.665	0.082
V5	0.990	- 0.126	0.033
V6	0.888	0.436	0.148
V7	0.316	0.888	0.369
V8	0.827	0.577	0.032
V9	0.887	0.412	0.207
V10	0.911	0.360	0.200
V11	0.609	0.793	- 0.016
V12	- 0.495	- 0.847	- 0.118
V13	0.590	0.757	- 0.134
V14	0.878	0.457	- 0.072
V15	- 0.148	- 0.494	- 0.851
V16	0.811	0.584	- 0.020
V17	0.947	0.245	0.204
V18	- 0.183	- 0.936	- 0.284
V19	- 0.496	- 0.862	- 0.097
V20	0.806	0.526	0.268
V21	0.711	0.669	0.106
V22	0.948	0.217	- 0.165
V23	0.909	0.406	0.092
V24	- 0.654	0.664	0.292
V25	- 0.068	0.078	0.983
V26	- 0.381	- 0.836	- 0.109

V27	0.739	0.670	.074
V28	0.932	0.327	0.155
V29	0.836	0.520	0.173
V30	0.451	0.724	0.495
V31	- 0.195	- 0.953	- 0.162
V32	- 0.319	- 0.908	- 0.259
V33	0.932	0.056	- 0.132
V34	0.858	0.498	0.103
V35	0.947	0.316	0.032
V36	0.957	0.263	0.102
V37	- 0.071	- 0.959	0.047
V38	0.869	0.465	0.160
V39	0.776	0.599	0.191

"Variance" Explained by rotated components

1	2	3
21.192	14.083	2.924

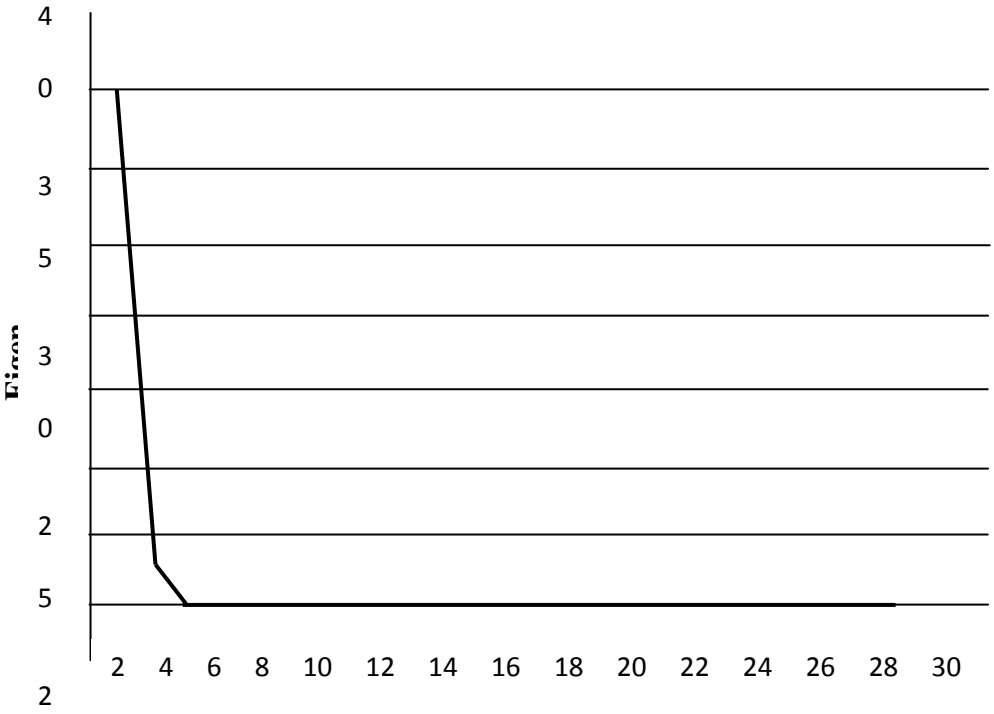

Figure 1: Factor Scree Plot Technique For : Classification of Variables into related Factors.

From Figure 1 the break in the slope is identified after factor 3. This implies that the cut-off is at Factor 3. The variables that loaded lowly with factor 3 having values ranging between 0.2 to 0.4 are labeled as low accessibility to professional advice on malaria and population growth as related to limited to health personnel and health facilities in the district and this factor explains at only 2.294% of the total variance in the rating of the factors that cause the occurrence of malaria in the county.

Overall above analysis has classified and ranked environmental variables into 3 groups of factors. The first significant factor is poor accessibility, unaffordability and incorrect use of anti-malaria drugs which accounted for 21.192% of the variance in variables attributable to the incidences of occurrences of malaria in the county.

Factor 2 identified as attributable to incidences of occurrences of malaria was socio-cultural and households' behavioural patterns which accounted for 14.083% of the variance in variables attributable to the incidences of occurrences of malaria in the county and Factor 3 identified was population growth and Governments role in management and control of malaria which accounted for 2.924% of the variance in the variables attributable to the incidences of occurrences of malaria.

3. Conclusion and Recommendation

The above analysis has shown significant environment environmental factors attributable to reemergence and upsurge in incidences of occurrences of malaria in the county as; deteriorating , socio-economic development health delivery services, environmental degradation, limited use of ITNs, poor knowledges of malaria and environmental sanitation , unregulated sourcing and distribution of anti – malaria drugs and high cost of malaria drugs medication.

Deterioration of socio – economic factors is related to poor knowledge of malaria due to inadequate health education by health providers to communities. Household behavioral patterns such as poor environmental sanitation, beliefs perception s and increasing poverty levels among communities constraints accessibility to timely diagnosis and medication of the disease. Poor knowledge of environmental sanitation and deforestation lead to local climate change and indicated by small increase in temperature both create suitable environments for mosquitoes breeding sites thus enabling increased malaria transmission. The ongoing unregulated sourcing, distribution and in appropriate use of anti- malaria drugs are real challenges to the county and central Governments health ministries regarding control management of increasing malaria burdens in the county

It is evident from the above results that strategies to control and manage increased cases of malaria burdens in the county include; improvement of accessibility (transport) networks systems to link all low cost health facilities and rural areas , regulation of sourcing and distribution of anti – malarial drugs by concerned Governments ministries of health to minimize and eliminate distribution and the sell of counterfeit anti – malaria drugs by Quacks and Shopkeepers, good governance and improvement of socio – economic status of the communities by provision of health education and environmental health education in primary schools so as that children know about malaria and its control as they grows and economic empowerment of community to enable them access to health services and other related services.

Furthermore, the Local and central Governments can consider provision of free ITNs, malaria medication starting with vulnerable population strata, infants, children, expectants mothers and people with special needs and furthermore indoor residential spraying of houses should be timely and widespread particularly in high risk areas of the county.

With all the above strategies affected, poverty reduction can be realized and is in line with Kenya Government's Vision 2030 and beyond poverty reduction Millennium Development Goals.

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