



## POTTIES, PITS AND PIPES: EXPLAINING HYGIENE BEHAVIOUR IN BURKINA FASO

VALERIE CURTIS,<sup>1</sup> BERNADETTE KANKI,<sup>2</sup> THIERRY MERTENS,<sup>3</sup>  
 ETIENNE TRAORÉ,<sup>4</sup> IBRAHIM DIALLO,<sup>5</sup> FRANÇOIS TALL<sup>6</sup> and  
 SIMON COUSENS<sup>6</sup>

<sup>1</sup>Maternal and Child Epidemiology Unit, London School of Hygiene and Tropical Medicine / Centre Muraz, BP 153, Bobo-Dioulasso, Burkina Faso. <sup>2</sup>Centre Muraz, BP 153, Bobo-Dioulasso, Burkina Faso. <sup>3</sup>Global Programme on AIDS, World Health Organisation, Geneva 1211, Switzerland. <sup>4</sup>Ministère de la Santé, de l'Action Sociale et de la Famille, BP 1508, Bobo-Dioulasso, Burkina Faso. <sup>5</sup>Service de Pédiatrie, Hôpital National Sourou Sanou, BP 676, Bobo-Dioulasso, Burkina Faso and <sup>6</sup>Maternal and Child Epidemiology Unit, London School of Hygiene and Tropical Medicine, London WC1E 7HT, England

**Abstract**—Stool disposal practices have been shown to be associated with childhood diarrhoea. However, efforts to promote improved hygiene behaviour are hampered by a lack of understanding of what determines those behaviours. Data from 2793 household interviews with mothers of children from the town of Bobo-Dioulasso in Burkina Faso were analyzed to examine what differentiated mothers who reported using safer stool disposal practices from those who did not. Three 'outcomes' were considered: where the child was reported to defaecate; where the mother reported disposing of the child stools; and whether excreta were observed in the compound. Regression models were developed to identify those factors with the strongest independent associations with the outcomes. There was a consistent association between the source of water and the outcomes. Mothers with access to a tap in the yard reported using safe hygiene practices three times more often than mothers using wells outside the compound and twice as often as mothers who used public standpipes or wells within the yard. The source of water showed a similar pattern of association with observations of faecal matter in the environment. Improved sources of water may contribute to safer stool hygiene by reducing the time spent on water collection or by encouraging mothers to conform to higher standards of hygiene. Other factors which played a role in predicting the hygiene behaviour of mothers were the husbands' occupation, the number of health education sessions that she had attended, her zone of residence and family ownership of certain valuable objects. These factors are likely to be related and to be, to some extent, proxies for the real determinants of her behaviour. A model of the cultural, psycho-social and infrastructural proximate determinants of hygiene behaviour is proposed. Data from focus group discussions suggested that the main purpose of hygienic behaviour is to conform to existing norms of social etiquette. Trials of interventions based on changing such norms are needed to test whether this is an effective means of promoting of safer hygiene practices.

*Key words*—hygiene behaviour, stool disposal, diarrhoea, Burkina Faso

### INTRODUCTION

While there is evidence that improved water supplies and sanitation can substantially reduce the incidence of childhood diarrhoea in developing countries [1] it is increasingly held that improvements in such infrastructure are a necessary, but not sufficient condition for a positive impact on health [2]. Cairncross [3] has suggested that the health benefits which do arise stem largely from the changes in hygiene behaviour which are made possible by improvements in water and sanitation.

Evidence of an association between the hygiene behaviour of child carers and the incidence of childhood diarrhoea has been provided by a number of studies. Researchers in Sri Lanka and in the Philippines found that failure to dispose of stools hygienically was related to an increased incidence of diarrhoea in young children [2, 4]. In Papua New Guinea higher rates of child diarrhoea were recorded

in compounds where stools were observed on the ground [5]. A study in Bangladesh found that diarrhoea incidence rates were inversely related to disposal of children's faeces combined with the use of handpump water and maternal handwashing [6]. A number of other studies [7-10] have suggested that maternal handwashing reduces the incidence of childhood diarrhoea. Findings from the present study in Burkina Faso [11] suggested that there was a 30-50% increase in the incidence of child hospitalizations with diarrhoea when mothers disposed of child stools other than in a latrine. The risk of diarrhoea was about 35% higher for children living in compounds where human stools were observed on the ground.

The increasing realization of the role that hygiene behaviour plays in the occurrence of childhood diarrhoea has encouraged policy makers and donor agencies to call for increased resources to be made available for the promotion of safer hygiene practices, in parallel with programmes to improve water supply

and sanitation infrastructure [12, 13]. Effecting change in human behaviour is a complex and uncertain process. However, the chances of success are likely to be greater when programme planners have an understanding of what inhibits or enables the adoption of specific protective behaviours. In this paper we examine the social and environmental factors that may be linked to a number of hygiene practices reported by mothers of young children in an urban West African setting.

## METHODS

### Study site

The study was conducted in Bobo-Dioulasso, the second largest town in Burkina Faso. The town has a population currently estimated at about 350,000 people spread over 25 administrative sectors (shown in Fig. 1). Most of the town is laid out on a grid pattern with wide avenues bordered by open drainage ditches. Each residential block is composed of a number of walled compounds, each of which may house extended families or unrelated families who rent buildings. Most daily domestic activity takes place in a central yard which is communal. Nine out of ten compounds had one or more unimproved dry pit latrines. Domestic rubbish is generally taken to open heaps and is collected at irregular intervals. The central zones of the town are well supplied with piped water, either through shared courtyard taps or public standpipes.

In the rapidly expanding outlying zones, the most usual sources of water are public standpipes and unprotected hand-dug wells which are located inside or outside compounds.

### Data collection methods

Household interviews with the mothers of two groups of children were carried out. The first group consisted of the mothers of children 36 months and under, who had been hospitalized for any cause during the period January 1990 to March 1991 and who were resident in the town. The second group had children of similar age recruited from amongst the neighbours of the first group. The questionnaire collected information which included demographic factors (child's age, number of siblings), economic factors (father's and mother's occupations, size of the house, ownership of objects such as a television or cassette-radio), use of health services and the sector of residence. We classed the town into seven zones corresponding to areas which were built up simultaneously during the historical expansion of the town. Zone A in Fig. 1 is the ancient nucleus of the town whilst zone G corresponds to the outlying areas which have been most recently settled. In addition mothers were asked where their child normally defaecated and where they usually disposed of their child's stools. During the visit fieldworkers toured the compound and latrines and noted whether human and/or animal stools were visible on the ground within the compound.

In addition to the information obtained by interviewing, 10% of households were revisited by a different fieldworker on a day following the first visit to carry out structured observations of behaviour. The observer arrived at 6 am and spent 2½ hours in the courtyard noting on a precoded form such practices as where the child defaecated and how, or if, her stools were disposed of afterwards. The observer did not have access to the results of the first interview.

Two series of focus-group discussions with mothers from different social and economic backgrounds were carried out before and after the household surveys. Key informant interviews were also held with members of the Bobo-Dioulasso health service staff. These techniques were designed to help formulate the quantitative research instruments and to provide a wider understanding of perceptions concerning child health and hygiene.

### Data analysis

Three variables from the household questionnaire were selected as outcomes of interest. Two were practices related to child stools: where the mother reported that the child defaecated and where she reported that she disposed of the stools. As an indirect indicator of hygiene practices we also retained the presence of human stools on the ground in the compound, as noted by field workers. These variables were recoded to produce three binary hygiene outcome

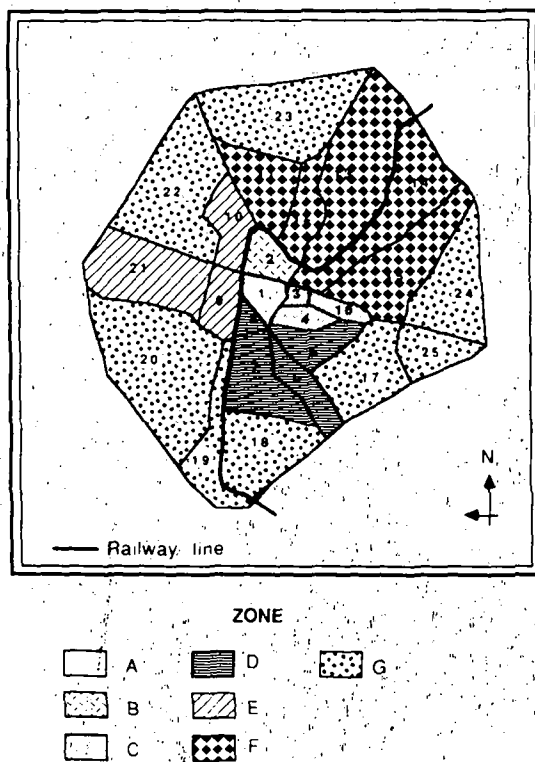


Fig. 1. Bobo-Dioulasso administrative sectors.

Table 1. *P* values for the crude associations between hygiene 'outcomes' and potentially explanatory variables

Potentially explanatory variables	Where child is reported to defaecate <i>P</i> < 0.05	Where stools are reported thrown <i>P</i> < 0.05	Stools seen in yard <i>P</i> < 0.05
Child's age (0-5 6-11 12-17 18-23 24-36 months)	Yes	Yes	No
Mothers' education (none primary secondary)	No	Yes	No
Mothers' ethnic group (local:other)	Yes	Yes	No
Mothers' economic activity (salaried small trade none)	No	Yes	No
Fathers' economic activity (salaried irregular-cultivator)	Yes	Yes	Yes
Size of the house (0-24 25+ m <sup>2</sup> )	No	Yes	No
Owens a cassette-radio (yes no)	Yes	Yes	Yes
Owens a TV (yes no)	Yes	Yes	Yes
Child has vaccination card (yes/no)	No	Yes	No
Health education sessions (0-6/7+)	Yes	Yes	No
Number of siblings (1/2-3/4+)	Yes	Yes	No
Principal water source (tap-standpipe private well/public well)	Yes	Yes	Yes
Sector of the town (zone A:B/C/D/E/F/G)	Yes	Yes	Yes
Period of residence in the town (0-4:5-10/11+ years)	No	No	No
Season of recruitment (rainy/cool/hot)	No	No	No

variables (safe/unsafe) depending on whether the reported or observed practice or condition was likely to be associated with faecal contamination of the environment. Behaviours and environmental conditions recoded as 'safe' were, respectively: child reported to defaecate in a pot; child stools reported disposed of in a latrine and human stools not observed on the ground in the yard.

Associations between these outcomes and a variety of socioeconomic and environmental factors were then examined. Table 1 lists these hypothetically explanatory variables. First, the hygiene outcome variables and the 'explanatory' variables were cross-tabulated and the  $\chi^2$  test used to identify crude associations. Logistic regression models were then developed in order to identify those factors which were most strongly linked with each outcome using the EGRET statistical package. All explanatory variables crudely associated with the outcome (*P* < 0.05) were included in the model. Then the least statistically significant variable in this model was dropped and the new model tested. This process was repeated until all variables left in the model had a statistically significant association with the outcome variable.

## RESULTS

A total of 1388 interviews with mothers of children recruited at the hospital and 1405 interviews with mothers of children recruited from amongst neighbours of the hospitalized children were carried out. Both populations were comparable on a wide range of variables; they were therefore combined to give a total of 2793 household interviews for analysis.

### *Where do children defaecate and why?*

Figure 2 shows how the reported site of child defaecation varied markedly with the age of the child. Linen use was mostly confined to infants; only 9% of linen users were aged over 12 months ('linen' here

means underpants or strips of cloth cut up to serve as nappies). No children aged under 12 months went outside to defaecate. Pots are introduced early in Bobo-Dioulasso: 46% of children under 6 months and 82% of children over 12 months were reported to be placed on a pot to defaecate. Overall 75% of children were reported to use a pot.

Children who were reported to defaecate in a pot were compared with those who were reported defaecating elsewhere. The first column of Table 1 shows that nine of the 15 potential explanatory variables had a statistically significant association with the reported use of a pot at the 5% level.

Table 2 shows the factors that were retained in the final regression model. The likelihood that the child defaecated in a pot increased with age up to a maximum in the 12-17 month age group and then decreased again as children began to use the ground for defaecation. Pot use declined with fathers' declining income category; the child of a cultivator used the pot half as often as the child of a father with a regular salary. Children of mothers whose ethnic origin was outside the region used the pot nearly twice as often. Use of the pot was associated with an increasing number of health education sessions attended by the mother. The use of the pot decreased with decreasing availability of water: children of households who drew water from an external well used the pot a third as often as those with a tap in the yard.

### *Where do stools end up and why?*

Sixty-seven percent of mothers reported throwing stools into the latrine, 26% throwing them outside the compound, 7% throwing stools into a corner of the yard, 0.4% burying them in the yard and 0.3% of mothers reported that the child used the latrine. Figure 3 shows how the stools of older children are more likely to be thrown in the latrine than those of infants.

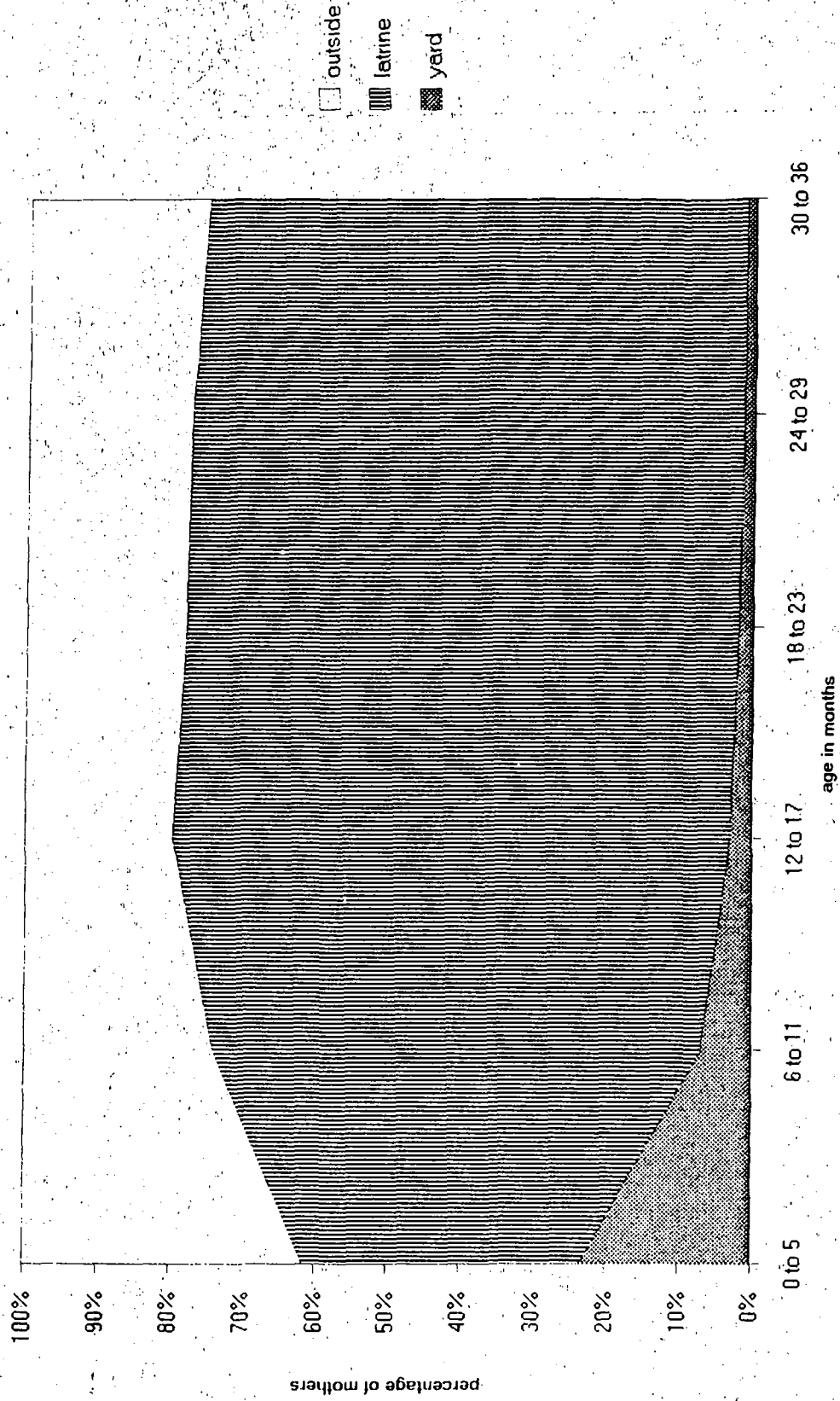


Fig. 2. Stool-disposal practices among 2783 mothers of children aged 0-36 months by age. Bobo-Dioulasso.

Table 2. Logistic regression model for where child defaecates

	Child defaecates:		O.R.	95% I.C.
	In a pot (%)	Elsewhere (%)		
<i>Child's age (months)</i>				
0-5	228 (11)	262 (37)	1.00	—
6-11	576 (28)	167 (24)	4.44	(3.41, 5.78)
12-17	496 (24)	75 (11)	8.39	(6.10, 11.53)
18-23	333 (16)	73 (10)	5.95	(4.29, 8.24)
24-36	449 (22)	124 (18)	4.61	(3.47, 6.12)
<i>Mothers' ethnic origin</i>				
Local	992 (48)	426 (61)	1.00	—
Non-local	1090 (52)	275 (39)	1.70	(1.40, 2.07)
<i>Fathers' economic activity</i>				
Salaried	1431 (69)	408 (59)	1.00	—
Irregular	442 (21)	160 (23)	0.81	(0.64, 1.03)
Cultivator	200 (10)	124 (18)	0.48	(0.37, 0.64)
<i>Health education sessions</i>				
0	511 (25)	215 (31)	1.00	—
1-6	927 (45)	316 (46)	1.30	(1.04, 1.63)
>>6	608 (30)	156 (23)	1.54	(1.19, 1.99)
<i>Water source</i>				
Tap in yard	658 (32)	139 (20)	1.00	—
Standpipe	712 (34)	276 (39)	0.52	(0.41, 0.68)
Private well	518 (25)	160 (23)	0.67	(0.51, 0.90)
Public well	189 (9)	125 (18)	0.33	(0.23, 0.45)

Unsurprisingly, the reported site of defaecation was closely related to the method of disposal; children who defaecated in a pot were 26 times more likely to have their stools thrown into a latrine than elsewhere ( $P < 0.00001$ ).

The second column of Table 1 shows the thirteen variables that were associated with the manner of stool disposal at a level of significance of 5% or less.

A second regression model was constructed to investigate factors related to the site of disposal of excreta (Table 3). The model suggested that child stools were disposed of in the latrine more often as the child got older, though after 24 months of age, the use of the latrine again declined as some children went outside to defaecate. The type of water source showed the strongest association with where stools were disposed of; families with a tap in the yard used the latrine to dispose of stools five times more often than families who used wells outside the courtyard. Stools of the children of cultivators were disposed of in a latrine half as often as the stools of those whose fathers had a regular income. Families owning a cassette-radio used the latrine more often to dispose of stools and families living in zone B threw stools in the latrine twice as often as those living in zone A.

To investigate the possibility that the above associations were predictors of the ownership of a latrine, rather than of throwing stools in a latrine, the same analysis was carried out excluding data from the 11% of families who had no latrine in the compound. The model showed the same pattern as the previous one.

#### Stools on the ground

Field workers observed human stools on the ground within the compound on 13% of visits. Stools were visible less often where the child was reported to

defaecate in a pot ( $P < 0.001$ ) and half as often when the mother reported disposing of the stools in the latrine ( $P < 0.00001$ ).

Table 1 shows the five variables which had a crude association with whether stools had been seen in the yard. Table 4 shows the two factors that remained significantly associated with the presence of stools on the ground within the compound in the regression model. Stools were seen on the ground nearly twice as often in compounds in zone E than in zone A and two to three times more often when the source of water was a well or a standpipe rather than a compound tap.

## DISCUSSION

### What determines hygiene behaviour?

A multiplicity of theoretical models have been proposed to help explain, predict and change human health related behaviour. Early models proposed by Pavlov [14] and Skinner [15] suggested that environment and events affect behaviour; later models added cognitive factors [16] and reasoning [17, 18] as determinants of health protective behaviours. Recently McGuire's communication-behaviour change model [19] and the Precede-Proceed model [20] have extended the scope of the models to include systematic approaches for the promotion of behaviour change.

Figure 4 presents a conceptual framework for categorising factors which are potential determinants of hygiene behaviours. The framework proposes a series of factors which may be proximate determinants of hygiene behaviour, which are in turn influenced by the social and physical environment. This framework takes elements from several of the above models, adapted specifically to hygiene behaviours, and inserts them into an hierarchical framework similar to that proposed by Mosley and Chen for the determinants of child survival [21]. The framework suggests that factors in the external social and physical environment influence factors which operate at an individual level to determine specific hygiene behaviours. The model implies that for behaviour to change, change in the physical and social environment is required. We cannot test all elements of this framework since data was not collected on all of the factors, and many may be beyond the capacity of measurement and statistical analysis. However, the present research has enabled us to investigate associations between family income, maternal education, availability of water supply and health education, habitat, climate, to some extent 'culture' and some specific hygiene practices. The qualitative research has provided insights as to the role of some of the other factors.

### The role of water supply

One finding stands out strongly in this analysis: there is a consistent relationship between the water source and all three of the hygiene outcome variables. Compounds with domestic water connections were

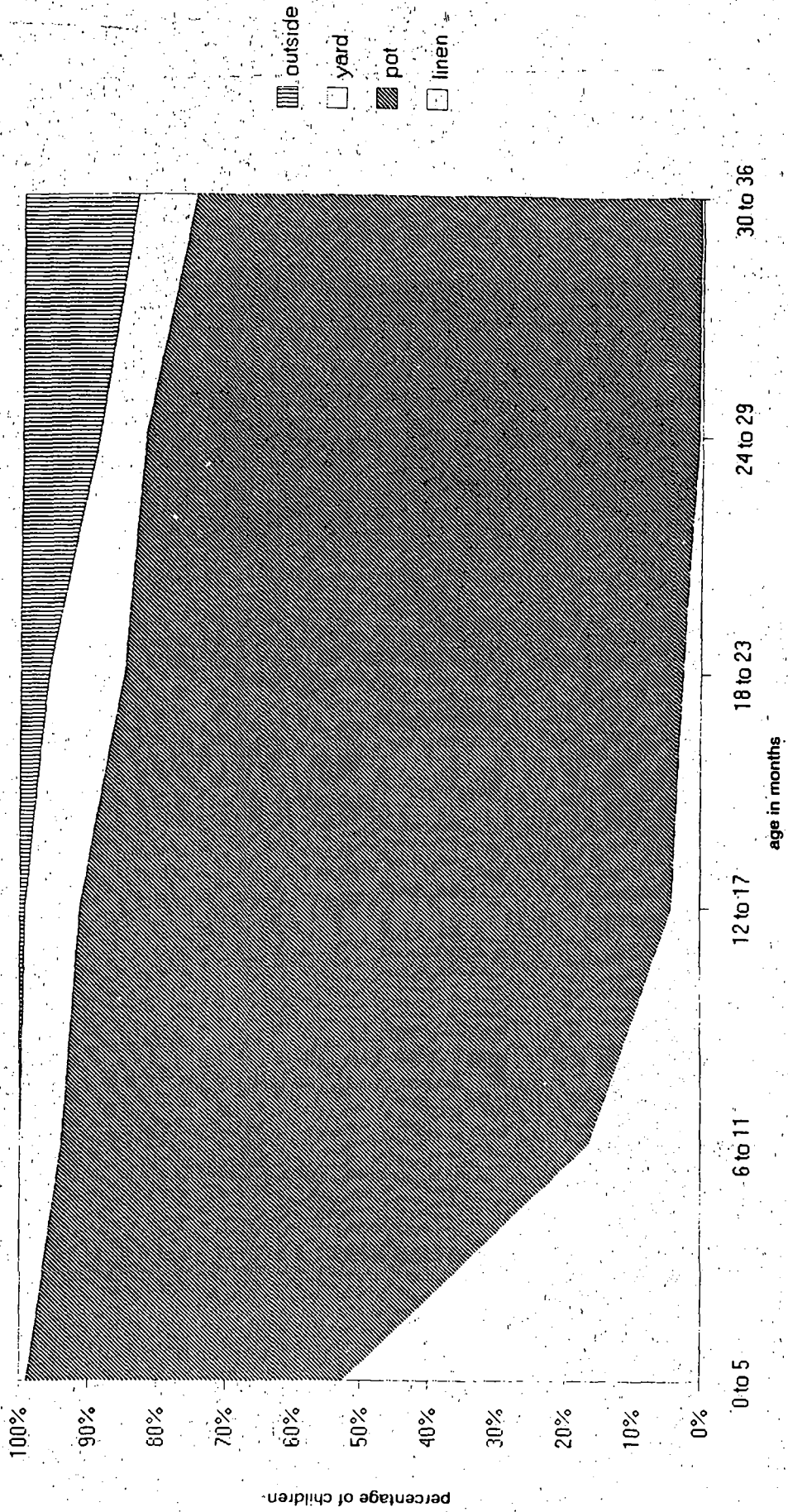


Fig. 3. Child defaecation behaviour among 2779 children aged 0-36 months by age. Bobo-Dioulasso.

Table 3. Logistic regression model for where child stools are disposed of

	Stools disposed of:		O.R.	95% I.C.
	In latrine (%)	Elsewhere (%)		
<i>Child's age (months)</i>				
0-5	186 (10)	303 (33)	1.00	—
6-11	499 (27)	245 (27)	4.21	(3.23, 5.49)
12-17	438 (24)	133 (14)	6.81	(5.07, 9.14)
18-23	309 (17)	97 (11)	7.12	(5.15, 9.82)
24-36	431 (23)	142 (15)	6.65	(4.97, 8.90)
<i>Fathers' economic activity</i>				
Salaried	1302 (70)	536 (59)	1.00	—
Irregular	388 (21)	215 (23)	0.80	(0.64, 1.00)
Cultivator	161 (9)	163 (18)	0.49	(0.37, 0.65)
<i>Owens a cassette-radio</i>				
Yes	987 (53)	372 (41)	1.00	—
No	872 (47)	540 (59)	0.77	(0.64, 0.93)
<i>Health education sessions</i>				
0	432 (24)	294 (32)	1.00	—
1-6	826 (45)	416 (46)	1.47	(1.19, 1.82)
>>6	567 (31)	197 (22)	1.93	(1.51, 2.47)
<i>Water source</i>				
Tap in yard	652 (35)	146 (16)	1.00	—
Standpipe	639 (34)	349 (38)	0.42	(0.33, 0.55)
Private well	441 (24)	236 (26)	0.47	(0.35, 0.62)
Public well	126 (7)	188 (20)	0.18	(0.13, 0.25)
<i>Sector (zone)</i>				
A	126 (7)	75 (8)	1.00	—
B	220 (12)	63 (7)	2.04	(1.28, 3.25)
C	203 (11)	102 (11)	1.04	(0.68, 1.58)
D	224 (12)	111 (12)	1.09	(0.72, 1.64)
E	360 (19)	113 (12)	1.35	(0.89, 2.04)
F	501 (27)	258 (28)	0.95	(0.66, 1.38)
G	229 (12)	198 (21)	0.72	(0.49, 1.06)

most likely to report 'safe' hygiene behaviours, they were less likely to do so when their water came from a well in the yard or was collected from a public standpipe, and safe practices were least often reported for households where water was collected from a well outside the compound. This apparent link may reflect a real association between the type of water supply and stool-related hygiene or it may have been due to bias or confounding in the study.

Confounding may have arisen if both water supply and hygiene behaviour are determined by a third variable. In Fig. 4 there are a variety of variables such as a mother's beliefs, priorities and 'self-efficacy' (a term proposed by Bandura which refers to a person's estimation of her capacity to effect change [17]) which

might determine both the hygiene behaviours that she adopts and the likelihood that she has a tap in the yard. However, in practice, families have limited control over the type of water supply that they use. The water source depends on geography: in some areas wells cannot be sunk, in others there is no standpipe or nearby pipework for domestic connections. Many families have little choice about which compound they live in and therefore what water supply facilities they have available.

Socio-economic status is another possible source of confounding. The type of water supply itself may have been a better predictor of the socio-economic status of families than the other indicators that we controlled for in the analysis. Whilst it cannot be discounted, this explanation seems unlikely. The models included a wide range of markers for socio-economic status: economic activities of the father and mother, ownership of certain valuable objects, size of house, sector of residence etc. Many of these factors dropped out of the logistic regression models whilst water supply remained significantly associated with stool hygiene.

The apparent association between reported stool hygiene behaviours and the type of water source could also be due to differential misclassification of the outcome variable. This could have arisen if mothers with a higher level of education were more likely to report their behaviour as safe, even when it was not, than mothers with less education. At the same time mothers with a higher level of education might also have been more likely to have had a better source of water. Comparing the results of the direct observations of stool hygiene with questionnaire responses for those with and without taps in the yard suggested that differential reporting bias can be discounted as the explanation for the observed association. For mothers who had a tap in the yard 17% of those who said that they disposed of child stools in the latrine were observed disposing of them elsewhere. For mothers without taps in the yard 26% of those answering 'latrine' were seen to dispose of stools elsewhere.

If the observed association between the type of domestic water source and a mother's hygiene behaviour is not due to bias or confounding, then water availability may be a determinant of stool hygiene. It would be reasonable to suppose that hygiene behaviours requiring the use of water would be facilitated by improved access to water. Indeed crude analysis of the data from direct observations of hygiene behaviours related to the use of water by 548 mothers suggested this to be so: water related practices were better in compounds which had a tap than in compounds where water had to be either drawn from a well or brought from outside. For example, mothers were observed to wash their hands after cleaning a child's bottom nearly twice as often in compounds with a tap than in compounds without (crude *O.R.* = 1.91, 95% *C.I.* 1.08, 3.37, *n* = 269). Mothers were observed to wash linen containing child stools

Table 4. Logistic regression model for whether human stools were noted on the ground in the compound

	Stools in the yard		O.R.	95% I.C.
	No (%)	Yes (%)		
<i>Source of water</i>				
Tap in yard	732 (30)	65 (17)	1.00	—
Standpipe	826 (34)	162 (43)	0.50	(0.36, 0.67)
Private well	586 (24)	89 (24)	0.48	(0.34, 0.69)
Public well	258 (11)	57 (15)	0.36	(0.24, 0.54)
<i>Sector</i>				
A	172 (7)	29 (8)	1.00	—
B	248 (10)	35 (9)	0.93	(0.54, 1.61)
C	277 (12)	30 (8)	1.49	(0.85, 2.56)
D	287 (12)	47 (13)	0.95	(0.57, 1.59)
E	381 (16)	91 (24)	0.56	(0.35, 0.92)
F	691 (29)	67 (18)	1.52	(0.94, 2.44)
G	352 (15)	74 (20)	0.88	(0.55, 1.41)

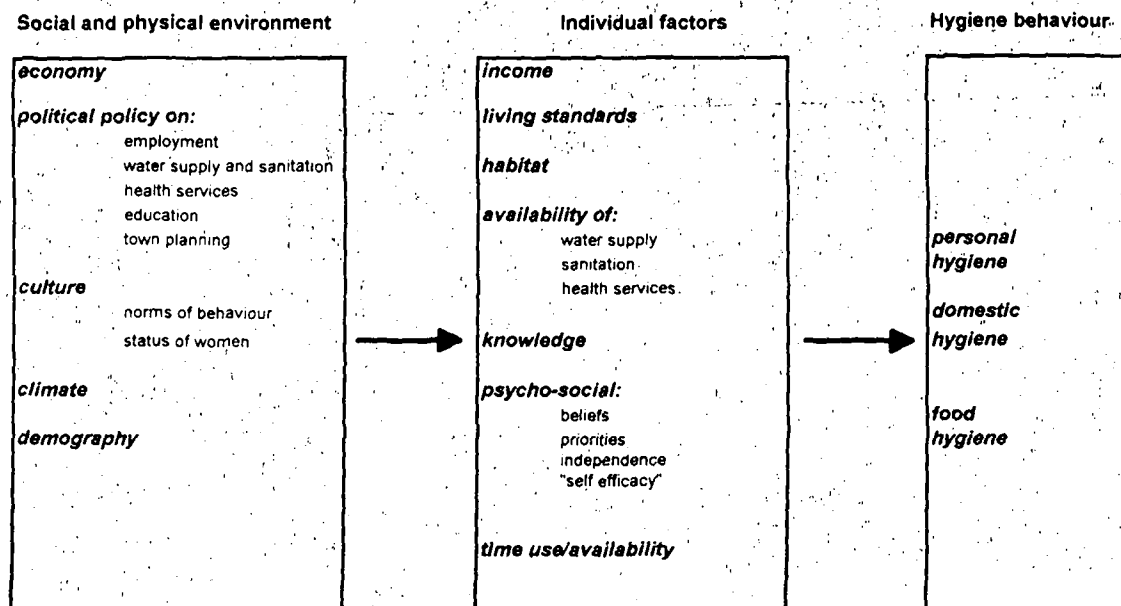


Fig. 4. Determinants of hygiene behaviours.

immediately after having been dirtied more than twice as often in compounds with a tap than in those without (crude *O.R.* = 2.24; 95% *C.I.* 0.74; 6.85,  $n = 79$ ).

We can hypothesize two ways in which water supply may influence stool disposal practices. First, mothers who have more easily available water have more time to spend on better stool disposal practices. Second, mothers who have improved sources of water may feel the need to conform to different and safer norms of hygienic behaviour.

A number of studies have explored the time savings made by women who have improved access to water. In a review of the association between mothers' lack of time and the utilization of child-survival technologies, Leslie [22] quotes a study in Kenya which suggested that increased availability of water did not save time because more trips were made to collect water and women were given less help by others in water collection. In Angola, Curtis [23] observed that mothers spent less time collecting water when sources were closer but that this time was spent in increased agricultural activities and leisure, not in more housework. However, it was impossible to separate child care from leisure in the data collection. In Mozambique Cairncross and Cliff [24] found that a better source of water allowed women to spend more time on leisure (mostly in the company of their children) and on housework. There is, therefore some evidence that in some settings improved water supplies may allow mothers to save time. This time may be redeployed in safer hygiene related activity. However, when the findings of the study were discussed with a group of female health educators from Bobo-Dioulasso, they preferred the hypothesis that having a better source of water changes a mother's priorities

with regard to hygiene. They suggested that a mother with a tap in the courtyard would be expected to conform to stricter norms of hygiene behaviour by family and neighbours, and thus to make more efforts to keep communal areas free of faeces.

#### *Hygiene practices and demographic factors*

As expected, the analysis confirmed that the age of the child was an important determinant of mothers' reported defaecation practices and stool disposal. Some of the reasons for this were explored in the qualitative research [25]. In focus group discussions mothers explained that whilst young infants defaecated in linen, once they were able to hold up their heads (4–5 months) children could be placed on a pot. Early pot use is facilitated by the use of anal purging, effectively placing the timing of child defaecation within the control of the mother. Mothers also explained that the stools of infants are often disposed of on the ground because they are not regarded as offensive or dangerous. However, by the time the child is eating a mixed diet (at 6–12 months of age) stools become offensive and need to be removed from sight and smell. Between the ages of about 2–8 years, children are generally sent to defaecate outside the courtyard in a drainage ditch or on a rubbish heap. Mothers explained that children in this age group could not be trusted to use a communal latrine without dirtying it or without running the risk of falling into the pit.

Though the crude analysis suggested that mothers with more children reported poorer hygiene behaviour, the multivariate analysis suggested that the number of children did not play an important role in determining stool hygiene practices.



### *Health education and hygiene behaviours*

The logistic regression models of the factors associated with mothers' hygiene behaviour suggest that reported child defaecation and stool disposal is safer when mothers have attended more than six health education sessions. The explanation for this observed association may be that the health education has directly influenced hygiene behaviour or it may be due to confounding factors or to some form of bias. Health education sessions are offered to mothers attending clinics for antenatal screening and for child growth monitoring. Groups are large, the clinics are often understaffed and the sessions cover a large number of topics in addition to the transmission of child diarrhoea. The results of our qualitative data collection suggests that even mothers who have attended large numbers of such sessions give little credence to the germ theory of disease and do not believe that hygiene is directly related to child diarrhoea [25]. However, it is plausible that mothers may follow the hygiene advice given at the health education sessions without believing in bio-medical theories of disease transmission. They may do it for a variety of reasons including wanting to be 'modern', to improve their social status or because they expect a benefit to health in general.

It is possible that mothers who attend health education sessions are from a different segment of the population which tends to practice safer hygiene. Confounding by socio-economic status has, to some extent, been controlled for in the analysis, but we cannot rule out other factors acting in a similar way. For example, our conceptual framework suggests that 'self efficacy'; a mother's belief in her own capacity to produce change, may determine her success in adopting new behaviours. Self efficacy may also determine the likelihood that she will choose to attend health education sessions. Dettwyler, writing about neighbouring Mali, has suggested a similar concept; that some mothers are more 'interventionist' than others [26]. If this is so, then interventionist mothers may make more efforts to attend health education sessions and also may take more trouble over domestic hygiene.

### *Living standards, psychosocial factors, knowledge and hygiene behaviour*

As we have seen, the factors which may determine hygiene behaviour are complex, interlinked and some are difficult to measure. If two factors have an equal effect on behaviour, inevitably the factor which is most accurately measured will appear to have the strongest effect. Similarly, factors which are closest to the outcome in the causal chain are likely to dominate in multivariate models.

Living standards are among those factors which are hard to define and harder to measure. However, possessing valuable objects such as a radio or television give some indication of standard of living, as does the size of the house occupied by the family.

(TV and radio ownership may also be markers for exposure to health education and to 'modern' ideas). We found consistently 'better' stool hygiene with increasing regularity of income of father and mother, increasing house size and with possession of a television set or a radio. However, the regression models suggested that the economic activity of the father, categorised by the regularity of income, has the most direct relationship with the reported sites of child defaecation and of stool disposal. The child of a cultivator used a pot half as often as the child of a salaried father, and stools were thrown into the latrine half as often when the father was a cultivator than when he had a salaried job. The husband's occupation is likely to have been a determinant of the family's standard of living. His occupation may also be an indicator of certain psychosocial factors such as a mother's beliefs and priorities. For example, the wives of cultivators may have been more likely to conform to village norms of behaviour and find it acceptable to dispose of stools in the open rather than in the latrines which belong to an urban style of living.

Though there was a crude association between the educational level reached by the mother and where she reported disposing of the child's stools, mother's schooling was notable for its absence in all of the final models. Content analysis of the 16 focus group discussions carried out at the beginning of the study suggested that mothers from all social groups, formally educated or not, had a consistent and coherent explanation for child illnesses which had diarrhoea among their symptoms. 'Dirt' was given as an explanation of only one out of ten distinct categories of diarrhoea related illness [25]. This category, 'la diarrhée des blancs' is the only one that resembles the western bio-medical conception of diarrhoea and is the only one for which modern remedies such as the use of oral rehydration or visiting a doctor were mentioned. Though this new category of diarrhoeal illness appears to have been added to the existing taxonomy, formal education seems not to have displaced traditional concepts of illness amongst mothers, neither has the germ theory of illness entered into the beliefs of the mothers in our discussions.

However, the discussions showed that for women in Bobo-Dioulasso, cleanliness is very important. It is considered 'dirty' and undesirable to have an unswept yard, unwashed dishes and pots and an untidy kitchen. Over 80% of mothers claim to bathe at least twice a day and mothers try to put on clean clothes to appear in public. Stools are avoided for their nuisance; because of the smell which 'stops you breathing' because they are 'heavy' and 'ugly to look at' and because they attract flies which can then alight on food and lay eggs on it. In Bobo-Dioulasso, as in many other societies (see Douglas, [27] for example), hygienic behaviours are instilled in girls and young women during the process of socialization and these norms are reinforced by her immediate society mainly for reasons of social etiquette and acceptability.

## CONCLUSIONS

Increasing awareness of the role played by human behaviour in the pathogenesis of disease has provided stronger motives to understand, predict and ultimately change it. Much research is now focused on behaviours such as those related to diet, sexual activity and substance abuse in developed countries. However, the literature concerning the behavioural components of the infectious diseases which are the dominant pathologies in developing countries is much less rich.

In this study we have explored factors which may have determined some specific reported hygiene practices of a group of urban African women. The results support the notion that the type of domestic water supply is an important determinant of a mother's hygiene behaviour. Mothers with access to a tap in their compound reported using safe stool disposal practices three to five times more often than mothers whose source of water was a well outside their compound. Mothers with access to a tap used safer practices about twice as often as those whose water came from standpipes or private wells. This pattern is confirmed by the indicators of stool hygiene practices examined in the study. We can therefore lend some support to the assertion made by Cairncross [3] that, if improved access to domestic water supplies produces health benefits, this may be because better access to water leads to improved hygiene behaviour. This study did not allow us to distinguish whether the observed improvements in hygiene practices were due to mothers conforming to higher standards of hygiene when better water supplies were available or because mothers who spent less time collecting water had more time available in which to practice safer behaviour.

Other factors which played a role as predictors of a woman's hygiene behaviour were her husband's occupation, the number of health education sessions that she had attended, her zone of residence and family ownership of certain valuable objects. These factors are likely to be interrelated and to some extent, to be proxies for factors which are the real determinants of her behaviour. These proximate determinants of hygiene behaviours (see Fig. 4) probably include cultural factors such as the prevailing norms of behaviour, psycho-social factors such as a woman's independence and 'self-efficacy' and the impact of significant others in her social environment.

Any future programme to reduce the impact of child diarrhoea in Bobo-Dioulasso might usefully both help to make water more accessible (possibly through the use of simple water saving devices) and also use methods which encourage change in the norms of behaviour which are initiated and maintained by the prevailing culture. Intervention studies designed to improve hygiene behaviour are needed to test the effectiveness of such approaches.

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