

Reducing Childhood Diarrhea Morbidity: Does Behaviour Change Matter? A Case Study from Northern Ghana

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Abstract

Diarrhea ranks second among the diseases reported in health institutions in Ghana, with children below 5 years of age from Northern Ghana being the worst affected. Using semi-structured interviews and focus group discussions conducted with 285 mothers drawn from various communities, this study was undertaken to identify local adaptive behaviours that could be modified for childhood diarrhea reductions in the Tamale Metropolitan Area (TMA), the largest urban centre in Northern Ghana and the third largest in the country. Findings reveal the importance of water and food storage practices as well as mothers' understanding and practice of hygiene in determining the incidence of childhood diarrhea morbidity. The study concludes that mothers' lack of understanding of the link between infections and diarrhea incidence is crucial and stresses that building the capacity of households and community members to recognize and change inappropriate behaviours can increase the efficiency and cost-effectiveness of child health intervention programs in Northern Ghana.

Introduction

Diarrhea is one of the deadliest childhood diseases in the world. It ranks among the top five health problems in many countries and is responsible for four to six million deaths of children under age 5 per year worldwide (World Health Organization [WHO] 2002). Diarrhea has been identified as the second most common health problem treated in outpatient clinics in Ghana. According to a Ghana News Agency (GNA) report in 2003, the disease accounts for 84,000 deaths annually in Ghana, with 25% of these being children under 5 years (GNA 2003). Diarrhea is the second most important cause of child morbidity and mortality in the Tamale Metropolitan Area (TMA), accounting for 5.8% and 7.2% of outpatient treatments in the metropolis in 2003 and 2004, respectively (Tamale Metropolitan Health Directorate 2005).

While there is reasonable evidence of the impact of improved water quantity and quality and sanitation on diarrhea incidence, the facts are generally not clear and consistent, most likely because of limitations in study design as well as the confounding effects of several environmental factors and cultural practices related to the disease. Evidently, gains made in achieving health infrastructure coverage over the last two decades, including the rehabilitation and equipping of the Tamale Teaching Hospital as well as the provision of community-based health planning services compounds, have not brought about as significant a health impact as donors had anticipated. Larsen (2002) has suggested that one of the fundamental weaknesses of the programs undertaken by various developing countries to attain the Millennium Development Goals (MDGs) is the tendency to give priority to water supply over sanitation, and sanitation over hygiene. It has also been argued that the presence of water does not mean that people will take advantage of it to wash their hands consistently and well (Favin et al. 1999). Moreover, poor water storage and use practices, as well as other poor hygiene practices, can easily contaminate even clean water that is available conveniently (Osumanu 2007).

There appear to be a reasonable agreement that interventions to improve hygiene at the household and/or community level have the greatest impact on diarrhea incidence (Favin et al. 1999; Jinadu et al. 2004). Several ethnographic studies on diarrheal diseases in children of various socio-cultural environments have noted that cultural attitudes and healthcare practices have an impact on the risk of diarrhea, indicating that modifying traditional practices in the home is necessary to reduce disease (Kendall et al. 1984; Coreil and Mull 1988; Malik et al. 1992). According to Cairncross (1996) and Jinadu et al. (2004), hygienic disposal of children's stools is associated with 30–40% less risk of serious diarrhea. Other studies have demonstrated that hand washing at appropriate times with appropriate techniques can reduce overall diarrheal disease morbidity by 30–50% (Black 1981; Khan 1982; Clemens and Stanton 1987). Contaminated food has also been shown a common vehicle for disease germs, accounting for an estimated 15–20% of diarrheal disease incidence (Esrey and Feachem 1989). A case-control study in Manila that correlated various home factors among children hospitalized with severe diarrhea found that low scores for kitchen hygiene (cleanliness of food and water storage containers and the sanitary condition of the cooking and eating areas) and overall cleanliness (general appearance of the house inside and out, and physical appearance of the mother/caretaker and index child) were strongly associated with high risk of severe diarrhea (Baltazar et al. 1993).

Viewed from the perspective of the health sector, hygiene intervention has been shown to be very cost-effective for the control of diarrhea in children under 5 years, comparing favourably with oral rehydration therapy (WHO 1979). According to Christoffers et al. (2005), the monetary cost of producing a unit of effect, such as the reduction of diarrhea cases, through a hygiene-promotion intervention provides value-added benefit relative to health and infrastructure investment. Improving the level of hygiene practices may be highly effective, although social and cultural factors may have a reinforcing or restraining influence. This explains why many hygiene interventions that attempted to reduce childhood diarrhea failed to demonstrate any effect (WHO 1979). Additionally, knowledge alone is not necessarily a strong predictor of desirable hygiene behaviour. In light of this, our study sought to identify local adaptive behaviours that could be modified and implemented while remaining culturally acceptable. The main objective was to provide the insights needed to design an effective intervention program to promote behavioural change for diarrhea reduction. Without these insights, any behavioural or social intervention program aimed at reducing the incidence of diarrhea in local communities might not be successful. We also discuss the evidence on cost-effectiveness of behavioural interventions to reduce the incidence of diarrhea, as this will be an important consideration when deciding whether to proceed with such programs in the population studied in this paper and in other jurisdictions.

The issues covered in this paper are presented in six parts. Following this brief introduction, the next section discusses the methods of collecting the data used in this paper; the third presents the incidence and determinants of diarrhea at the local level; the fourth describes cultural understandings related to diarrhea in the study area; the fifth presents evidence from the literature on

the cost-effectiveness of behaviour change to reduce diarrhea; and the last concludes with some recommendations to improve the implementation of effective behavioural change programs for the reduction of diarrhea. In this paper, behaviour is defined as an action or set of actions that an individual or group carries out routinely in daily life.

Materials and Methods

The data for this paper form part of a comprehensive survey conducted to establish the link between the environment and health in the Tamale Metropolitan Area of Ghana. A detailed description of how households were selected for the survey has been presented elsewhere (see Osumanu 2007). The analysis presented here is based on semi-structured interviews and focus group discussions conducted with 285 mothers. Issues covered in the survey include the mother's level of education, the household's access to and use of water and sanitation facilities, the mother's hygiene practices and the occurrence of diarrhea in children below 5 years. The use of the mother's knowledge and practices in this context is based on the notion that mother's and child's health are closely linked, particularly during nursing (Zaman et al. 1997).

Diarrhea was described to the mothers as the passage of watery stools, usually at least three times in a 24-hour period. (However, it is the consistency of the stools rather than the number that was most important.) Frequent passing of formed stools was not taken as diarrhea. Babies who feed on only breast milk often pass loose, "pasty" stools; this was also not deemed diarrhea. Diarrhea is often accompanied by stomach pains, feeling sick and vomiting (WHO 1979). The point prevalence of diarrhea and its occurrence over the preceding 2 weeks were measured by the mother's recall, as recommended in the WHO rapid assessment manual (WHO 1979). A composite variable representing the diarrhea history of the child was also constructed by summing the responses to the following questions, which mothers answered according to their own interpretation and recall:

1. Has your child had diarrhea in the last two weeks? (No = 0, yes = 5)
2. Does your child have diarrhea today? (No = 0, yes = 5)
3. Does your child often have diarrhea? (Never = 0, rarely = 1, sometimes = 2, often = 3, almost always = 5)
4. When was the last time your child had diarrhea? (Never = 0, more than two months ago = 1, last month = 2, last week = 3, this week = 4)
5. Was your child seriously ill with diarrhea in the last wet season? (No = 0, yes = 5)

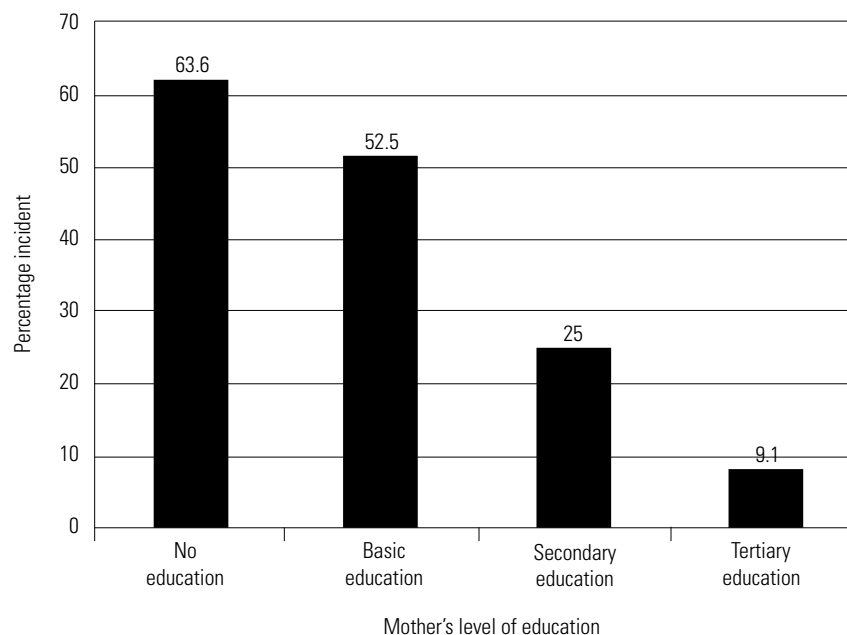
The wet season is usually accompanied by severe cases of diarrhea often translating into outbreaks of cholera in the Tamale Metropolitan Area.

The maximum composite variable score for this scale is 24. The composite variable scores provide a simplified scale for comparing the incidence (and frequency of occurrence) of childhood diarrhea among the various risk factors covered in the survey. The information on cost-effectiveness, presented in the fifth section, is based on literature review.

Incidence and Major Determinants of Childhood Diarrhea in the Tamale Metropolitan Area (TMA)

Of the children covered in the survey, 38% had had diarrhea in the 2 weeks preceding the interview, while only 6% had diarrhea on the day of the interview. Analysis of survey data (Figure 1) showed that children of mothers who had never been to school had approximately seven times as many cases of diarrhea compared with children whose mothers had received tertiary education ($F = 6.67$, $p = 0.03$). The association between childhood diarrhea and maternal education in the Tamale Metropolitan Area agrees with the findings of other studies in Ghana (Benneh et al. 1993; Tagoe 1995; Boadi and Kuitunen 2005) and other parts of West Africa (Togunde 1999). It has been argued elsewhere that the relationship between maternal education and childhood diarrhea is equally influenced by household wealth (Osumanu 2007).

Figure 1. Relationship between childhood diarrhea and maternal education (%)



Source: Based on questionnaire survey, 2005.

The study considered a number of household conditions in determining the major risk factors for diarrhea in children. The incidence of diarrhea in children was higher in the households that used water from vendors, boreholes and well/dugouts. Storing water in pots, sharing a toilet with more than four other households and not washing hands after defecation or before cooking were also associated with high incidence of childhood diarrhea. Other factors found to be responsible for high incidence of diarrhea in children were the presence of many flies in food preparation areas, not having a toilet facility and feeding children with cold leftover foods or prepared foods from open-air street vendors. Table 1 summarizes the results of the composite variable scores for the major household risk factors

Table 1. Major determinants of childhood diarrhea in TMA, Ghana

Risk factor	Number of households	Children's 2-week diarrhea prevalence (%)	Composite variable score (%)		
			0-8	9-16	17-24
Store water in pot	107	47.9	14.8	28.4	56.8
Share toilet with more than four households	192	36.8	15.6	30.2	54.2
Buy prepared food from open street vendors	122	45.1	20.8	28.5	50.7
Feed children with cold leftover foods	98	43.4	10.8	42.9	46.3
Depend on water from vendors	137	42.1	12.0	43.4	44.6
Do not wash hands after defecation	106	39.3	16.7	39.1	44.2
Do not wash hands before cooking	111	22.5	28.0	35.3	36.7
Many flies in cooking area	65	42.1	44.0	27.8	28.2
Depend on water from borehole, well or dugout	53	30.0	42.5	41.4	16.1
Have no toilet facility	16	35.5	47.0	37.3	15.7

Source: Based on questionnaire survey, 2005.

The association between diarrhea, vended water and toilet sharing has been adequately explained in the literature (Benneh et al. 1993; McGranahan, et al. 2001). While admitting that these conditions are made possible by the lack of adequate water supply and sanitation, it is also important to acknowledge the role of confounding factors arising from routine practices of water and toilet use in explaining the occurrence of childhood diarrhea. For example, water is often used for several domestic chores. The water used to wash vegetables is afterwards used to wash dishes and/or hands. Also, households cope with the problem of frequent interruptions in water supply by storing water in containers such as barrels, plastic cans, pots and buckets. However, household water storage, used to make up for intermittent or insufficient piped water, provides reservoirs for diarrhea pathogens, particularly for poor households who cannot afford safe storage containers (Osumanu 2007).

The use of pots to store water in particular was associated with significant incidence of childhood diarrhea. It must be noted that pots themselves do not contaminate water. Of concern, is the way pots and their contents are treated. Pots are generally kept in open places, usually not covered or well covered, and exposed to dust and domestic animals. Children within the household usually scoop water directly from them, with any “reasonably” clean cup or bowl for drinking, increasing the risk of contamination. In addition, pots are hardly ever disinfected, since most households do not know about disinfection. The consumption of contaminated water is further increased by the failure of households to treat water, by boiling or filtering, before drinking. Households fail to treat water because of the lack of real acceptance of water’s role in causing disease as well as an unwillingness to purchase materials for water treatment, particularly filtering. Reasons for non-treatment of water were: materials for water treatment are expensive, 27.4%; time consuming, 25%; boiling of water produces flat taste, 24.6%; and good quality, 23%.

Handing washing after defecation appears to be a function of whether there is a toilet in the home. Ninety percent of mothers with flush toilets in their home said they washed their hands any time after defecating, compared with only 25% of mothers who used public toilets. Generally, communal toilets (mostly pit, including the Kumasi-ventilated improved-pit latrines) do not offer water for hand washing. The majority of people who used these facilities and washed their hands after defecating happened to be Muslims, who carried their own water whenever they visited the facilities, depicting a general situation where Muslims washed their hands after defecating but in most cases without soap. The danger associated with carrying water to toilets is that children usually also drink water directly from the ablution containers, increasing the risk of diarrheal diseases.

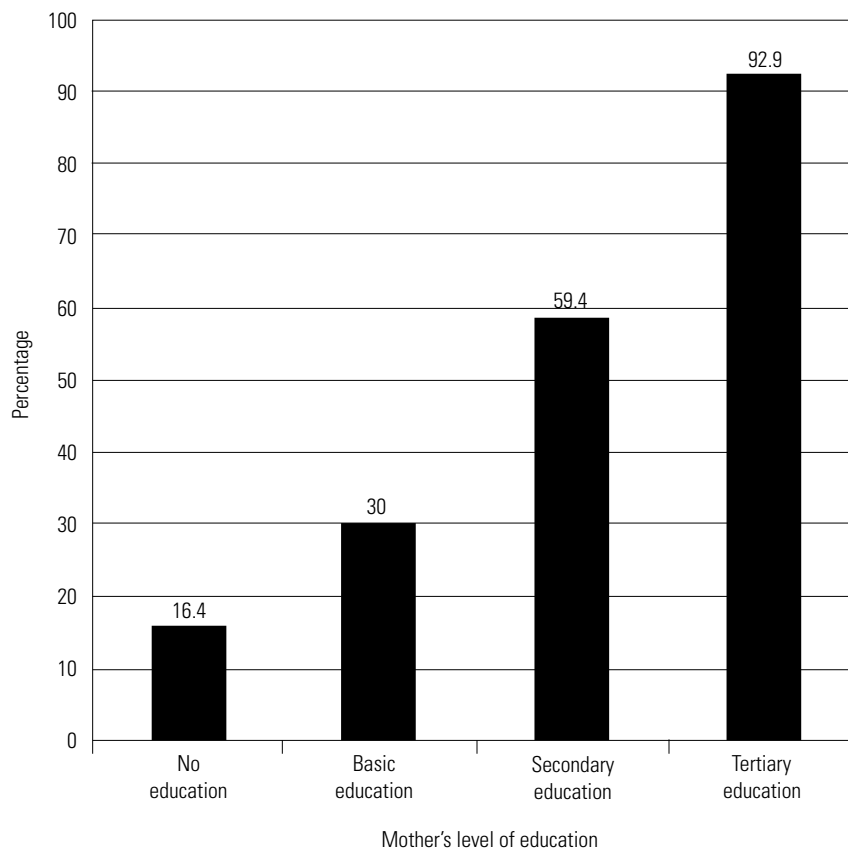
Although the scarcity and cost of water influenced the way in which it was used, having water conveniently available inside the house did not seem to affect hand washing before food preparation. Cultural beliefs related to the concept of “cleanliness” and the social prestige attached to it seem to be most important in explaining mothers’ hand-washing behaviours. There are four kinds of “dirtiness” and, therefore, “cleanliness” that may lead mothers to wash their hands:

1. Perceived “dirtiness”: mothers wash their hands when they are visibly soiled, smell strongly or feel sticky. This is the most common reason for hand washing.
2. Contaminating “dirtiness”: mothers wash their hands when they have been in contact with anything considered dirty, such as garbage, human feces or urine. Although mothers reported that they wash their hands on these occasions, observation showed that this is not always the case.
3. Social “dirtiness”: mothers wash their hands when they wish to improve their general physical appearance. This type of hand washing is very common and occurs before receiving guests at home. It is associated with esthetic values.
4. Religious “dirtiness”: mothers wash their hands when they are compelled to fulfill their religious obligations. Islamic teaching in connection with hand washing stipulates that hands must be washed as many times as possible and in connection with these occasions: on waking from sleep, when leaving the toilet, before and after eating food, after touching the genital or anal area or that of others, after touching a dead body, after touching any dirty or suspicious

thing, when a dog is touched (hands must be washed seven times), and in ablution before the five daily prayers, when the hands are washed three times on every occasion (plus washing the face, throat, nose, ears, arms and feet and rubbing the hair with water). These frequent hand washings are done by every practising Muslim.

How mothers wash their hands depends on the kind of dirtiness. For perceived, contaminating and religious dirtiness, “clean” water alone or, in a few cases, clean water with soap, is used. For social dirtiness, “clean” water alone is considered adequate. Mothers usually dry their hands on their clothes. They may also, in a few instances, use nappies or any available material. The differences regarding mothers’ hand washing behaviours becomes larger when looking at habits of washing hands with soap and water. Since hand-washing habits are related to a mother’s knowledge of the links between hygiene and health, hand washing with soap is largely dependent on the educational attainment of the mother which, in turn, is also influenced by a household’s ability to afford soap. Figure 2 shows the relationship between hand washing with soap and educational attainment of the mother. This finding is consistent with earlier ones from other parts of the country (Benneh et al. 1993; Gyimah 2003; Boadi and Kuitunen 2005).

Figure 2. Relationship between mother’s education and hand washing with soap (%)



Source: Based on questionnaire survey, 2005.

The overwhelming emphasis placed on the role of vended food in causing diarrhea in the literature has led many people to believe that food poisoning is associated with eating food outside the home. However, this is rarely the case in many low-income communities, and the majority of incidents occur within the home environment. Most poor households do not understand the

principles of basic food hygiene such as hand washing before food preparation and how to cook food safely, or that unhygienic kitchens attract vermin such as rats and mice, and that flies transmit various diseases. Other considerations are the bacterial content of cooking and feeding utensils. All these are possible sources of food contamination within the home environment. One factor that emerged in this study as a major determinant of childhood diarrhea is feeding children with cold leftover foods (Table 1). For many low-income households in the metropolis, leftover cooked foods constitute a major component of morning meals and, to a lesser degree, midday meals as well.

The role of leftover foods in the prevalence of childhood diarrhea emanates from food-storage practices. Improperly stored food can go bad and contain pathogens. The use of refrigerators to store leftover foods is not popular in the metropolis. Many households prefer to store their leftover foods in a covered dish. The frequency of food contamination with pathogens is high when inefficient storage methods are used; however, this depends on the food type, storage time, the ambient temperature of storage and the temperature reached on rewarming before feeding. The risk of contamination is increased by the fact that most staple foods in the metropolis are potentially hazardous when left overnight. These include meat and meat products, fish, dairy products, soups, cooked rice, grains and cereal. This is reflected in a larger proportion (65%) of households for whom leftover foods spoiled rapidly. The survey results revealed that when a covered dish is used to store leftover foods, the average spoilage time is 24 hours.

The presence of houseflies in the domestic environment is widely recognized as a potential health hazard in many low-income communities. When considering the presence of flies in the kitchen and, therefore, the risk of exposing food and drink to flies, it is important to recognize the role of many household factors. The use of open containers to store solid waste in the house before final disposal is more likely to attract flies to the kitchen. About 90% of households that used open containers to store waste reported having many flies in their cooking area. Another striking difference is the relationship between the type of kitchen and the presence of flies. Households with separate rooms for kitchens had far fewer flies than those cooking in communal kitchens, on verandas, or in the open air and cooking huts. Other conditions associated with the presence of many flies in the kitchen were keeping domestic animals in the house and the use of "chamber pots" for defecation by children.

Local Beliefs and Attitudes about Diarrhea

The study revealed a relatively low level of knowledge about the causes and effects of diarrhea in children. Generally, mothers identified two forms of diarrhea – binsaa and tirikanyera. Binsaa is common diarrhea not accompanied by vomiting. Bin is from the word bini, which means feces, but the whole word binsaa refers to watery stool. Mothers believe that binsaa is caused by "hot" foods, hunger and teething. Binsaa is seen as an old and traditionally known condition of imbalance in life forces and is considered a cleansing of the inside of a child and a washing away of impurities from the child's stomach. It is therefore seen as a normal part of growing up – not an illness but a usual occurrence in the young child's life. This is how a mother described the effects of binsaa: "Binsaa is surely not dangerous, for all young children suffer multiple episodes of it and most of them continue to live in reasonably good health."

Tirikanyera is diarrhea accompanied by vomiting. Tirikanyera is a compound word made up of tiri, which means vomiting, and nyera, which means defecating. This form of diarrhea is believed to be caused by ingestion of "dirty foods." Traditionally, tirikanyera is considered somehow dangerous and is therefore given some attention.

Diarrhea is simply not perceived as life-threatening or even debilitating. This is because many infected children do not suffer to any great extent. The economic and environmental conditions of low-income community members also explain their inability to avoid diarrhea risk factors. Economic deprivation considerably affects ability to access clean water and better sanitation, as well as provide soap for hand washing. Again, the fact that the disease is chronic and usually untreated by households leads to high rates of re-infection. Re-infection is very common, as exposure is usually

continuous. Many mothers mistakenly believe that with diarrhea children should stop eating and drinking, fearing that these activities would cause indigestion, making things worse. However, diarrhea causes rapid depletion of water and sodium – both of which are necessary for life. If the water and salts are not replaced fast, the body starts to “dry up” or get dehydrated. If more than 10% of the body’s fluid is lost, death can occur (Healthlink Worldwide 1995). Appropriate medicine and visits to a clinic or health centre are not considered necessary for a condition that is not accepted as one of ill health. However, in cases where diarrhea persists for 3 or 4 days, mothers usually provide some management in the home. Management measures derive from the folk perception of the cause and severity of the disease. The decision may also be influenced by the educational level of the mother. Mothers with a higher level of education are more likely to use a combination of Western and traditional treatments. Health centres, clinics and hospitals are additional important sources of advice and prescriptions for the therapy of childhood diarrhea outside the home. However, due to lack of understanding of disease condition, limited access, long waits for attention, misgivings about the effectiveness of Western medicine and cultural dependency on traditional methods, the formal health sector is often used as the last resort.

So far, oral rehydration therapy (ORT) seems to be the most accepted remedy for diarrheal diseases. However, knowledge of oral rehydration salt (ORS) is low among many mothers in Tamale, hence its use remains very low, mainly as a result of lack of health education. The underutilization of ORS may also be due to the lack of acceptance of the taste, as many mothers reported that their children did not like it. Health workers also frequently fail to provide ORT or to advise mothers and caretakers to administer it at home. When ORS is recommended, there is often a greater emphasis on how to prepare it at home than on how much should be given, how long ORT should be continued, how to recognize severe dehydration or the importance of continued feeding during diarrhea episodes.

Cost-effectiveness of Behavioural Change

The important role of behavioural change interventions for the control of diarrheal diseases has been justified in terms of high cost-effectiveness by several studies. Cost-effectiveness is the cost, in monetary terms, of producing a unit of effect such as a reduction in the number of diarrhea cases, through some intervention such as a hygiene promotion (Varley and Bendahmane 1997). Cost-effectiveness analysis compares program costs to program performance as measured by health impact (i.e., dollar cost per unit of effect). It is often expressed as the amount in US dollars spent per case of illness averted, death averted and averted disability-adjusted life years (DALYs). The WHO estimates that an intervention is cost-effective when it costs less than 25 US dollars per DALY saved (WHO 1981). The World Bank (1993) suggests a cut-off for cost-effectiveness at 150 US dollars per DALY saved as the defining criterion for cost-effective interventions for child survival programs.

A Case Study of Cost-Effectiveness from West Africa

One of the few cases in West Africa where cost-effective analysis data exist and have been documented objectively is the Saniya program in urban Burkina Faso (Borghi et al. 2002). The demographic and socio-cultural profiles of the case study area, Bobo-Dioulasso, are similar to those of Tamale. Hence the use of this cost-effectiveness analysis will provide a basis for pushing for hygiene intervention strategies in Northern Ghana. To estimate the cost-effectiveness of the 3-year Saniya Hygiene Promotion Program in Bobo-Dioulasso, with a population of 341,000, Borghi et al. (2002) measured behaviour change associated with the prevention of diarrheal diseases. The program’s effects were estimated through a time-series method of observing 37,319 mothers. In particular, the study showed that hand washing with soap after cleaning a child who had defecated rose from 13% to 31%, and safe disposal of children’s stools rose from 80% to 84%. Hand washing with soap after latrine use by mothers increased from 1% to 17%. The study concluded that the program changed the hygiene practices of 18.5% of mothers of young children, and it was therefore seen as an effective program.

Health impacts were not measured, but using the literature, Borghi’s team estimated that the

impact of hand washing with soap is likely to result in an average reduction in diarrhea incidence of 42%. They assumed that 10% of children with diarrhea are taken to see a health agent and another 10% see a traditional practitioner. An assumption that 3.7% of children with diarrheal disease require hospital admission was taken from an earlier study in the same town in Burkina Faso (Soton 1994). Based on a global review study (Bern et al. 1992), Borghi et al. (2002) assumed that 1.21% of childhood diarrhea cases result in death. These figures, used in combination with the above-mentioned change in hygiene practices by 18.5% of mothers, led to the following estimates of the impact of the program: 8638 cases of diarrhea, 864 outpatients, 324 hospital referrals and 105 deaths averted.

Borghi et al. (2002) showed that the total cost to the provider of the 3-year intervention was 292,000 US dollars. That is converted to 0.65 US dollars per head of population covered or 4.55 US dollars per seven-person household, after deducting the cost of the international research component. The significant proportion represented by overheads was illustrated by the fact that 63% of this total was composed of project administration and undifferentiated start-up costs. Most of the remaining costs were accounted for in roughly equal measure by house-to-house visits, discussions in health centres, hygiene lessons in schools and street-theatre presentations. The total program cost of 292,000 US dollars apportioned over the 8638 cases of diarrhea averted resulted in a cost of 24 US dollars per case. On the other hand, on the basis of the observed increase in prevalence of hand washing with soap, the intervention was estimated to avert sufficient diarrhea morbidity and mortality to save 15 US dollars per compliant household per year in direct costs of medical care and indirect costs due to lost productivity. Cost-effectiveness of the study was not expressed in DALYs, but Borghi et al. (2002) measured cost-effectiveness by stating costs per diarrhea episode averted, per outpatient visit averted, per hospital referral averted and per death averted. The study concluded by mentioning that the program has been cost-effective because it reduced the occurrence of childhood diarrhea in Burkina Faso to less than 1% of the Ministry of Health budget and less than 2% of the household budget, and could be replicated at even lower costs.

Conclusion and Recommendation

The study revealed a significantly wide gap in awareness of the role of infection in causing diarrhea in the Tamale Metropolitan Area. Improving access to safe drinking water and adequate sanitation facilities alone may not lead to significant reductions in the incidence of childhood diarrhea in the metropolis unless accompanied by a change in mothers' attitudes and behaviours. Good hygiene practices can accelerate a reduction in the present morbidity pattern and improve the quality of life of the people in the area to a great extent. It therefore presupposes that while creative technological solutions are certainly needed to bring about diarrhea reductions, the greatest of all challenges is to ensure that appropriate behaviours are followed. Although there is no documentary information on the cost-effectiveness of hygiene interventions for diarrhea reductions in Ghana, the Saniya program case study in Burkina Faso provides a justification for adopting similar strategies in the Tamale Metropolitan Area. Any effort to reduce childhood diarrhea in the metropolis must be built around effectively applying principles of integrated hygiene education at the household level. Interventions include encouraging households and mothers to adopt hygienic water storage practices, appropriate kitchen and food hygiene and safe disposal of children's feces and promoting the practice of hand washing with soap and water.

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