Cost and financial sustainability of a household-based water treatment and storage intervention in Zambia

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ABSTRACT

Providing safe water to >1 billion people in need is a major challenge. To address this need, the Safe Water System (SWS) - household water treatment with dilute bleach, safe water storage, and behavior change - has been implemented in >20 countries. To assess the potential sustainability of the SWS, we analyzed costs in Zambia of "Clorin" brand product sold in bottles sufficient for a month of water treatment at a price of $0.09. We analyzed production, marketing, distribution, and overhead costs of Clorin before and after sales reached nationwide scale, and analyzed Clorin sales revenue. The average cost per bottle of Clorin production, marketing and distribution at start-up in 1999 was $1.88 but decreased by 82% to $0.33 in 2003, when >1.7 million bottles were sold. The financial loss per bottle decreased from $1.72 in 1999 to $0.24 in 2003. Net program costs in 2003 were $428,984, or only $0.04 per person-month of protection. A sensitivity analysis showed that if the bottle price increased to $0.18, the project would be self-sustaining at maximum capacity. This analysis demonstrated that efficiencies in the SWS supply chain can be achieved through social marketing. Even with a subsidy, overall program costs per beneficiary are low.

Key words | cost analysis, diarrhea prevention, sensitivity analysis, social marketing, water treatment, waterborne organisms

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INTRODUCTION

Going to scale with innovative public health interventions is a major challenge in global health (Victora *et al.* 2004). Interventions that have proven effective in community trials and operations research efforts must be scaled up to have the impact needed to address critical public health problems. This challenge is best exemplified by the need for improved water and sanitation services. The World Health Organization (WHO) estimates that over 1.1 billion people in the developing world lack access to improved water supplies (World Health Organization (WHO) 2003). Tens of millions more rely on improved community water supplies that may not deliver microbiologically pure water, or that require water to be carried home and stored, exposing it to the risk of contamination (Mintz *et al.* 2001). One consequence of this deficiency in public health services

is the problem of diarrheal diseases, which cause 2.2 million deaths annually, most in children under 5 years old in developing countries (World Health Organization (WHO) 2003). While the provision of safe water infrastructure to the world's poor will take decades and require an investment of tens of billions of dollars, the health of vulnerable populations can be protected in the short to medium term by scaling up access to inexpensive, effective, alternative water quality interventions.

The Safe Water System (SWS), a household-based approach to improving water quality that employs simple, robust, and inexpensive technologies appropriate for the developing world, is one such intervention. The SWS, developed by the Centers for Disease Control and Prevention (CDC), the Pan American Health Organization, and

WHO consists of three elements: water disinfection with locally produced dilute sodium hypochlorite solution, promotion of safe water storage practices, and behavior change techniques, such as social marketing (Quick 2005). The objective is to make water safe through disinfection and safe storage at the point of use. Field trials of the SWS have demonstrated that its use reduces the risk of diarrhea by 30 to 90% (Semenza *et al.* 1998; Quick *et al.* 1999; Reller *et al.* 2001; Roberts *et al.* 2001; Quick *et al.* 2002). The success of the SWS in preventing diarrheal disease has resulted in efforts to increase access to SWS products through social marketing using commercial channels for widespread product distribution (Dunston *et al.* 2001; Makutsa *et al.* 2001). The experience of SWS in Zambia offers an opportunity to investigate the intersection of two key contemporary issues in global public health – the financial costs of going to scale with an effective public health intervention and the private sector supply of public health products (Conteh & Hanson 2003; Hanson *et al.* 2003).

In 1998, the Society for Family Health (SFH), a non-governmental organization (NGO) that specializes in social marketing and is the Zambian affiliate of Population Services International (PSI), initiated a SWS social marketing campaign in Zambia, giving the disinfectant solution the brand name Clorin. In an efficacy study, regular use of Clorin decreased the risk of diarrhea episodes among household members by 48% (Quick 2005). Product sales of Clorin in Zambia have increased annually since 1998 with 1.7 million bottles sold in 2003. In a country of 10 million persons with an average per capita income (GNI) of only $380 (World Bank, Gross National Income per Capita in 2003, Atlas Method, US$), the household use of Clorin, shown in a national survey to be 14% (Olembo *et al.* 2004), is remarkable. As efforts continue to expand the use of SWS globally financial evidence is needed to bolster current epidemiological and programmatic evidence. This paper describes the assessment of the production, marketing, and distribution costs for Clorin in Zambia through SFH from 1999 to 2003, estimates levels of product subsidy, and examines the prospects for financial sustainability of this important public health product. Like many social marketing projects in developing countries, Clorin in Zambia is supported with donor funds and user contributions, a so-called mixed approach. We examine the cost structure

of Clorin production, marketing and distribution in the PSI product portfolio and revenue generation at different stages of the product cycle (Victora *et al.* 2004; Kikumbih *et al.* 2005) in order to more fully understand the supply side financial dynamics.

CLORIN OPERATIONS IN ZAMBIA

Clorin, a 0.5% sodium hypochlorite solution, is produced through an electrolytic process from a 3% salt and water mixture, and packaged in 250 ml bottles. During 1999–2000, the first two years in our cost analysis, the Society for Family Health had seven hypochlorite generators in five production sites (Lusaka, Kitwe, Mansa, Kasama, and Livingstone). In 2003, SFH had eight hypochlorite generators but centralized production to three key sites (Lusaka, Kitwe, and Mansa - Figure 1).

SFH motivates populations to purchase and use health-oriented products through "social marketing" techniques that increase demand for, access to, and proper use of Clorin and other essential health products like condoms, and various family planning methods (Population Services International 2005). Social marketing methods include dissemination of information at clinics, markets, and schools; peer education; community education through a traveling mobile video unit; radio advertisements; wall paintings; and posters, brochures and t-shirts. SFH targets two audiences in its promotional campaigns: mothers of children under five, and school age children, who play a role in influencing parents to adopt healthier behaviors.

Clorin retails at pharmacies, drugstores, grocery stores, motels/hotels, bars, workplaces, and private clinics. One 250 ml bottle of Clorin lasts about one month in a typical household if used daily. It is sold at a discounted price to distributors, wholesalers, non-governmental organizations (NGOs), public clinics, and schools. Those who purchase 120 or more bottles at a time receive an additional volume discount. Wholesale and retail prices for Clorin remained stable from 1999 until mid 2003, but increased in September 2003 as a strategy to enhance the level of cost recovery (Table 1). Clorin is distributed in Zambia through a national network of production sites, field offices, and retail outlets. When an order for Clorin is placed, sales staff

Figure 1 | Map of Zambia with Society for Family Health offices indicated.

located at one of three production sites deliver "ready to stock" product to the field office requesting the order. Clorin distribution expanded from seven field offices in 1999 to nine in 2003. The expansion of the distribution network focused in the Mongu and Solwezi regions where Clorin sales were least developed.

METHODS

In July 2000, data on the production, marketing and distribution costs of the Clorin operation were collected from the Lusaka production site, the largest production site and location of SFH headquarters. Data were collected for two periods: 1) all of calendar year 1999; and, 2) January to June of 2000 (data were collected midyear for year 2000). These data represent costs before scale up of both supply and demand for Clorin had occurred in Zambia. In March 2004, similar data were collected for calendar year 2003 from all Clorin production sites located in Lusaka, Kitwe and Mansa. Cost data were collected through a review of accounting, procurement, management and warehouse data, unstructured interviews with key SFH staff and direct observations of production, marketing and distribution activities of the Clorin operation. Data included expense reports, sales reports, production ledgers, procurement purchase orders, inventory records of production raw materials and promotional items, employee salary histories,

Table 1 | Clorin wholesale and retail transfer prices* for Zambia Safe Water System social marketing project, 1999–2003

| | Cost (Zambian Kwacha [ZMK] and US Dollars [$]) | | | | | |
| | 1999 | | 2000 | | 2003 | |
Year	ZMK	$	ZMK	$	ZMK	$
Wholesale price	681		540		300	
					500	
Retail price	817		648		350	
					600	
Weighted price†	749	0.16‡	594	0.12*	413	0.09

*The price that Society for Family Health charges wholesalers and retailers.
†1999 and 2000 prices were standardized to 2003 monetary values using the consumer price index.
‡Weighted price was calculated based on number of bottles sold that year at wholesale and retail prices and takes into account the price increase in 2003.

and income statements. Interviews were conducted with key informants regarding cost accounting procedures, job responsibilities, time allocated to Clorin, and estimates of the costs associated with their respective part of the operation. Cost data were first categorized by activity for each operational component (production, marketing, distribution, and overhead) and then separated into fixed and variable costs. Raw materials and labor costs incurred for Clorin production, and fuel, vehicle maintenance, per diem, and distribution salaries incurred for Clorin distribution were regarded as variable costs. All other costs were regarded as fixed.

Fixed costs (costs that do not change with the level of production) were allocated using a standard step down procedure starting with the determination of whether costs for Clorin were shared with other SFH products. Expenditures were recorded for each input in current Zambia Kwacha (US \$1 = 4797.80 ZMK (2003)) with the exception of capital costs that were recorded in \$U.S. Capital costs were amortized over a period of 2 to 20 years, depending on the life expectancy of the capital item, and recurrent costs (costs incurred for goods and services consumed in the course of a budget year, and that must be regularly replaced) were calculated on an annual basis. Salaries of the local staff

and the resident expatriate technical advisor were included in the analysis. Cost data are presented in Zambian Kwacha and US dollars. Prices in 1999 and 2000 were standardized to 2003 using International Monetary Fund published exchange rates and Consumer Prices Indices (International Monetary Fund 4 A.D. 2004; Population Services International 2005).

For variable costs (costs that vary directly with changes in the number of units produced or sold), data were available for the calendar year 1999, January-June 2000, and calendar year 2003. To calculate the variable costs of production, raw material and labor costs were determined for each time point. The cost of raw materials per bottle of Clorin produced was calculated and divided by the average number of bottles produced per production cycle. The cost of labor, including total salary per month and overtime pay, per bottle of Clorin was determined separately for the three time points. In 1999 and 2000, labor costs had a semi-fixed cost element; workers were paid for a day's work regardless of the number of bottles produced. In 2003, workers were paid based on the number of bottles produced.

The cost of raw materials per bottle and the labor per bottle were multiplied by the total number of bottles at each time point to determine the respective per bottle variable costs for each operational component. The average variable cost (AVC) per bottle is the sum of the component variable costs. Total cost per bottle is the sum of average variable costs and average fixed costs.

Sales data were obtained from an Access database designed and maintained by an in-house SFH data analyst. Sales data were stratified by field office, type of customer, and volume of Clorin purchased to determine revenues. Cost and sales data were imported from Access databases to Excel spreadsheets where data were analyzed. Data that were not available in Access or Excel format were abstracted from paper records into Excel for analysis. Production, marketing, and distribution costs were compared with revenues to assess profit and loss, which subsequently allowed us to ascertain the level of product subsidy. By projecting costs and revenues under a maximum capacity scenario (see Results section for description), we were able to assess prospects for financial sustainability. All analyses were conducted from the perspective of SFH.

Table 2 | Breakdown of total operational costs per bottle for Zambia Safe Water System social marketing project, 1999–2003

Year	Average variable cost/bottle		Average fixed cost/bottle		Total cost/bottle‡	
	ZMK	$	ZMK	$	ZMK	$
1999	1,839	0.38	7,220	1.50	9,059	1.88
2000	1,513	0.32	2,702	0.56	4,215	0.88
2003	872	0.18	689	0.15	1,561	0.33
Change in costs over time period*		−0.20		−1.35		−1.55
Percent change†		−53%		−90%		−82%

*(2003 cost-1999 cost).
†(2003 cost-1999 cost)/1999 cost.
‡Average variable cost + Average fixed cost = Total cost.

RESULTS

Cost analysis

The average cost per bottle of Clorin production, marketing and distribution decreased from $1.88 in 1999 to $0.33 in 2003 representing an overall decrease in costs by 82% (Table 2). The average variable costs per bottle decreased by 53% from $0.38 in 1999 to $0.18 in 2003. The average fixed cost per bottle decreased by 90% from $1.50 in 1999 to $0.15 in 2003.

The total cost of running the Clorin operation increased by 59% from $351,327 in 1999 to $558,879 in 2003. Production costs increased by 98%, distribution costs increased by 154%, and overhead costs increased by 89% (Figure 2). Overhead costs increased stepwise between 2000 and 2003 when sales reached scale in 2003. This required additional administrative support and supplies. Marketing costs decreased by 21%. The proportion of costs attributable to each component changed over time. Production costs increased from 30% of total costs in 1999 to 37% in 2003. Similarly, distribution costs increased from 17% of total costs in 1999 to 27% of total costs in 2003. Marketing costs decreased from 40% of total costs in 1999 to 20% in 2003. Overhead costs increased slightly from 13% of total costs in 1999 to 16% in 2003.

While the *total cost* of running the Clorin operation increased, the cost *per bottle* of each component decreased as the number of bottles sold increased from 187,079 in 1999 to 1.7 million in 2003. From 1999 to 2003, production

costs per bottle decreased by 78%, marketing costs decreased by 91%, distribution costs decreased by 74%, and overhead costs decreased by 81% (Table 3).

Production

As demand increased, evidenced by increasing sales, production expanded and the total variable costs of production (raw material and labor) went from $40,370 in 1999 to $168,022 in 2003. The average variable cost of production *per bottle* decreased by 52%. The raw material component of production variable costs decreased by 50%, from $0.16 in 1999 to $0.08 in 2003. Similarly, the labor component decreased by 60%, from $0.05 in 1999 to $0.02 in 2003.
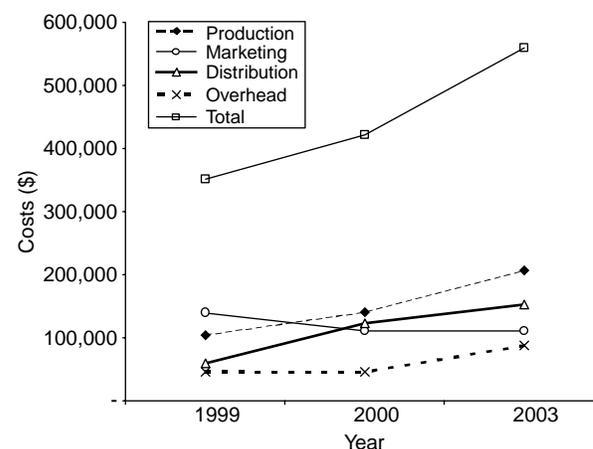
Figure 2 | Production, marketing, distribution, and overhead costs for Zambia Safe Water System social marketing project, 1999–2003.

Table 3 | Production, marketing, distribution, and overhead costs per bottle for Zambia Safe Water System social marketing project, 1999–2003

Year	Total # bottles	Production		Marketing		Distribution		Overhead		Total	
		ZMK	$	ZMK	$	ZMK	$	ZMK	$	ZMK	$
1999	187,079	2,656	0.55	3,610	0.75	1,567	0.33	1,226	0.26	8,991	1.89
2000	482,000	1,405	0.29	1,081	0.23	1,243	0.26	486	0.10	4,215	0.88
2003	1,712,700	597	0.12	321	0.07	413	0.09	230	0.05	1,561	0.33
Change in cost			−0.43		−0.69		−0.24		−0.21		−1.57
Percent change			−78%		−91%		−74%		−81%		−83%

Sales

SFH generated annual sales of 187,079 Clorin bottles in 1999. Sales more than doubled in 2000 to 482,000 bottles and continued to increase beyond projections to 1,712,700 bottles in 2003 (Figure 3). Of the total number of bottles sold in 2003, wholesalers purchased 81% and retailers purchased 19%.

Revenues

Revenues increased from $29,216 in 1999 to $129,895 in 2003 (Table 4) while costs of generating sales increased from $351,327 in 1999 to $558,879 in 2003. In spite of increased revenues, SFH Clorin operations incurred a financial loss but the loss per bottle decreased from $1.72 in 1999 to $0.24 in 2003. A simple break-even analysis graph (Figure 4) shows that the total cost curve and the total revenue curve at the 2003 price of $0.09/bottle do not intersect. Based on 2003 fixed capacity the SFH operation did not achieve a break even point.

Maximum capacity scenario

In 2003, the hypochlorite machines were not being used to capacity. In a scenario keeping fixed costs and staffing per machine constant, but increasing the batch sizes to the maximum capacity of the machines, 4.98 million bottles could be produced yielding an increase in revenues from $129,895 to $448,470. In this projection,

the loss per bottle decreases from $0.24 to $0.09 (Table 4). A sensitivity analysis conducted on the price point shows that the break-even point can be achieved at a price of $0.18 at maximum capacity which generates revenues of $896,940 (Figure 4). However, by doubling the price per bottle, sales could decrease which would decrease prospects for breaking even. Without increasing the price, the break-even sales volume of bottles where all fixed expenses in 2003 are covered is 2.8 million bottles. This is important in a scenario where a nonprofit organization may only subsidize fixed costs. To recover fixed and variable costs in 2003, the break-even number of bottles is 6.2 million. At maximum capacity, the
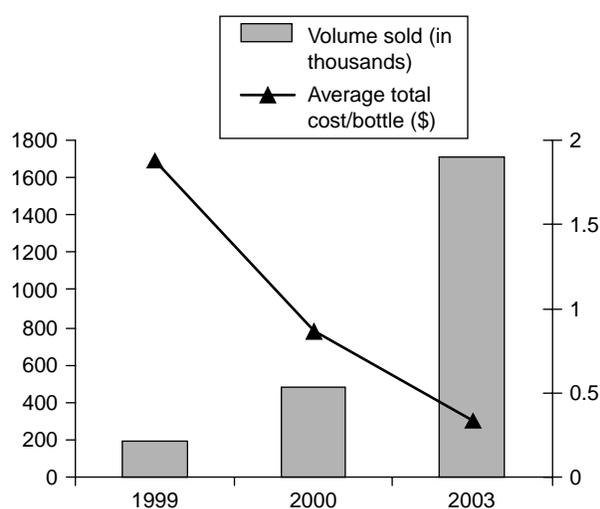

Figure 3 | Average total cost of Clorin as the volume sold increases for Zambia Safe Water System social marketing project, 1999–2003.

**Table 4** | Sales, revenues, and losses for Zambia Safe Water System social marketing project, 1999–2003

Year	Total # bottles sold	Total cost $	Total revenue $	Total loss $	Loss/bottle $
1999	187,079	351,327	29,216	322,111	1.72
2000	482,000	421,081	59,719	361,361	0.75
2003	1,712,700	558,879	129,895	428,248	0.24
Max Capacity*	4,983,000	899,985	448,470	451,515	0.09

*Projected maximum capacity of the Clorin production component.

break-even number of bottles for full cost recovery is nearly 13 million bottles. Fixed costs per bottle decreased in the maximum capacity scenario resulting in a decreased loss per bottle compared with that in 2003. However variable costs per bottle remain the same. With increased production in the maximum capacity scenario, total variable costs increase nearly 3 fold resulting in a larger break-even number of bottles in the maximum capacity scenario.

Cost drivers

Whereas fixed costs of production were the largest contributor to costs in 1999, production variable costs were the largest in 2003. Raw material costs contributed 63% of the total production costs in 2003. Distribution costs were the second largest total cost contributor with fuel, maintenance, and driver per diem representing 51% of the distribution costs. Marketing costs were the third biggest contributor to overall costs with communication,
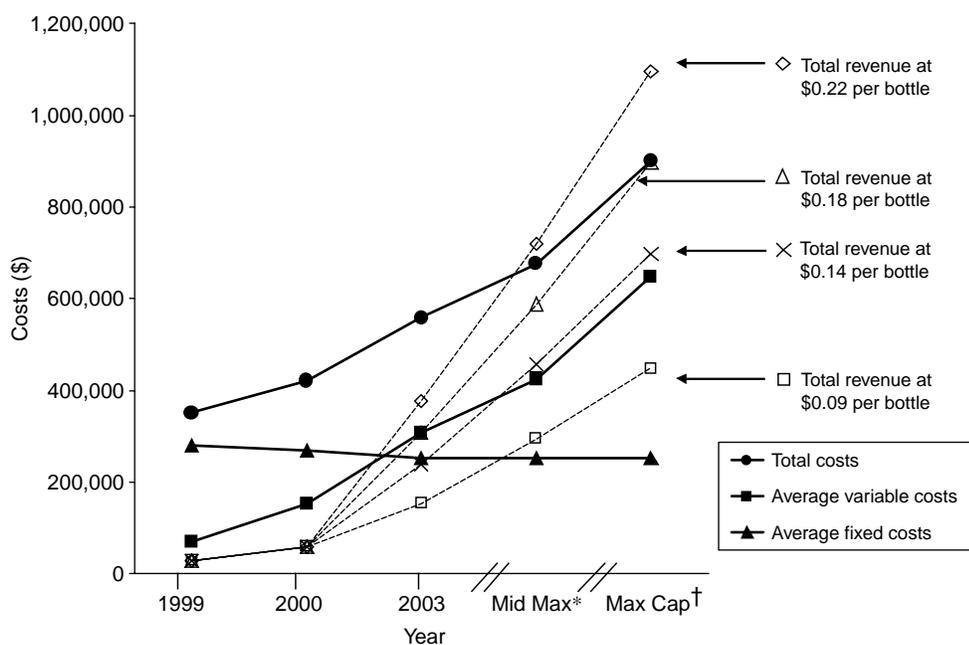
* Midpoint in sales of Clorin between 2003 sales and projected maximum capacity.
† Projected maximum capacity of production of Clorin bottles given the number of machines available in 2003

Figure 4 | Total costs and revenues and break-even analysis for Zambia Safe Water System social marketing project, 1999–2003.

advertising, and promotion expenses contributing to 46% of marketing costs. Management and administrative personnel salaries contributed to 73% of overhead costs.

CONCLUSIONS

This analysis represents the first cost analysis of a social marketing initiative from start-up to national scale. The analysis shows that, as sales increased nine-fold over 4 years, project costs increased only two-fold. Our findings suggest that efficiencies in production, marketing, and distribution can be achieved in social marketing.

The costs per Clorin bottle for SFH decreased significantly from $1.88 in 1999 to $0.33 by the end of 2003. The observed 82% decrease in total cost per bottle was primarily due to the 90% decrease in fixed costs from $1.50 to $0.15 per bottle. This indicates that the inevitable high start up costs were an important contribution to overall costs at the outset but in a relatively short period of time fixed costs per bottle decreased substantially as sales were scaled up nationwide.

Marketing costs per bottle decreased by 91% over the time period due to the distribution of such fixed costs over a larger number of bottles but also due to decreased marketing expenditures over the time period (decreased budgetary allocations to Clorin marketing as shown in accounting records; data not shown). Nevertheless, sales continued to climb, surpassing expectations in 2003. In the context of decreased marketing efforts, the price of Clorin decreased by 44% ($0.16 to $0.09/bottle) over the time period, likely having a large impact on the observed 8-fold increase in sales. The loss per bottle decreased from $1.72 to $0.24; however, when this loss per bottle is assessed over the total number of bottles sold, the total loss increased by 33%, indicating a price set well below cost recovery level. The amount that could not be recovered due to a price set below cost recovery represents the current subsidy required to maintain the project, which amounts to 77% of total program costs in 2003. Despite this level of subsidy, overall program costs per beneficiary remained quite low: approximately 4.2 cents per person-month of protection: one bottle of Clorin provides protection to a household of six for one month. 1.7 million bottles of Clorin were sold in 2003 providing 10.2 million person months of protection. 10.2 million person months of protection costs

$428,984 (Total cost − Total Revenue); thus 1 person month of protection costs 4.2 cents.

The question for this program, and any similar program requiring a subsidy, is how much subsidy is sustainable? NGO costs are typically donor dependent which puts any program suffering losses at risk because external funding may not always be forthcoming. Given the characteristics of Clorin, a product with both public and private good attributes, mixed financial strategies are needed, including the participation of the government. The overall net program cost for Clorin in Zambia, at less than $450,000, is modest for a national program that has an impact upon millions in a country of 10 million people. At this level of program cost, 6.7% of rural households reported use of Clorin in the Zambia Demographic and Health Survey of 2001–2002. A population-based survey in 2004 found that 42% of households reported current Clorin use, while Clorin use was confirmed by the presence of detectable free chlorine residuals in stored water in 20–33% of households (Olembo *et al.* 2004).

Total health expenditures in Zambia in 2002 were ZMK 847.4 trillion (US$ 179.0 million), 37.3% of which were from public funds (US$ 66.7 million) (Phiri & Tien 2004). With the current infrastructure, nearly 5 million bottles of Clorin a year, or approximately 3 bottles per household per year, could be produced at a programmatic cost of $899,985. This represents a highly reasonable investment to protect 50% of the Zambian population.

One potential scenario for improving the sustainability of this program would be to increase the product price, which would increase sales revenues and help close the gap between costs and revenues. Data in this analysis suggest that a price of 33 cents per bottle would permit full cost recovery at current production levels, a price increase of 367%. The risk of such an approach, however, would be to price the product out of the reach of the most vulnerable populations. At the base of the socio-economic pyramid are households that are most susceptible to morbidity and mortality from diarrheal diseases. This segment of the population has little or no disposable income and is least able to afford even the lowest product prices. The experience from other SWS programs suggests that demand is highly elastic. Increasing the price would run the risk of achieving sustainability objectives at the expense of failing to achieve health objectives. It is clear that new models of

implementation that accommodate simultaneous needs for cost recovery and accessibility to the very poor are needed.

Experience with user fees and water programs of many types suggests that increased consumer fees for water can make safe water unaffordable for the poor and vulnerable populations, with the consequence of greater inequality for a necessary public health input. The challenge for the SWS is thus the same as that for most other public health goods – those who have the greatest need have the least ability to pay. Higher prices for water mean that poor have to use less water or go without. With privatization and commercialization of water, rising prices have sometimes been accompanied by falling quality. Creative and targeted subsidies must be instituted to avoid these consequences – limiting water supplies for the most vulnerable and falling quality – for the SWS program.

In the absence of a price increase, an alternate strategy to achieve cost recovery may be to decrease costs of the operation by targeting the major cost drivers to achieve efficiencies. Production variable costs and, in particular, the cost of Clorin bottles and labor were the largest contributors to overall costs. In 2003, the primary supplier of plastic bottles for SFH, Kings Plastics, procured plastic from South Africa for bottle manufacturing in Lusaka. Strategies such as identifying producers of bottles using more local and efficient supply chains, or decreasing the bottle size and increasing the concentration of solution so that less plastic is needed may alleviate the need for plastic on the overall costs. Another opportunity to decrease costs of producing Clorin is to improve the efficiency of the production process. Observations of Clorin production revealed that the manual filling of bottles with the Clorin solution required multiple steps and was the least efficient process. Implementing a simple piped filling spigot system from the barrel of bulk Clorin solution with multiple stations with spigots for dispensation of solution into bottles or the installation of an automated bottling machine would likely decrease the time needed to fill the bottles and thereby decrease the labor costs per bottle.

Another strategy to increase sustainability may be to improve marketing. While costs of marketing have declined there is no reason to believe that the current level is optimal. Management decisions to decrease marketing may need to be re-evaluated to determine whether improved marketing could improve revenue and sustainability.

Currently the subsidy is on the supply side. While this allows the price to be lower to generate higher sales, the benefits of the subsidy go to all users, including those who would have been able to pay a full unsubsidized price. A complimentary strategy would be to subsidize purchase for the least well off. Coupons or some method for increasing sales among the least well off could increase sales and coverage. While the overall subsidy would either increase or remain the same under current bottle pricing, the subsidy would be targeted at those in greatest need.

A longer term strategy to increase access to Clorin in the context of price barriers is to implement income generation initiatives to improve the buying power of a population. For example, micro-credit programs developed to increase access to funds and fuel grass-roots entrepreneurship could improve the financial health of an impoverished population. Such approaches need to be further studied in the field to assess their impact and generate methodologies for implementation nationwide.

The implications of the findings of this study could be better understood through further research into the elasticity of demand for SWS products among different population and income groups in Zambia. Furthermore, data on populations using Clorin and the diarrheal disease burden in those populations, especially those in rural areas and the poor, are necessary to assess Clorin's effectiveness. The economics of social marketing differ from that of a purely commercial strategy, so future research should compare the two approaches to see whether social marketing leads to higher coverage of lower socio-economic groups and greater reach into rural areas (Kikumbih *et al.* 2005; Population Services International 2005). The literature on supply side factors for public health products has significant gaps including data on the market structure found in the private sector. The market structure for Clorin in Zambia presents an opportunity to use newer methods such as retail audits to refine methodological approaches to dealing with informal outlets and seasonality of sales (Conteh & Hanson 2003; Hanson *et al.* 2003; Victora *et al.* 2004).

Water quality improvement and sanitation have been arguably the most effective interventions in the history of public health (Cutler & Miller 2005). That governments and donors have not managed to provide universal access to safe water has been one of the great global public health disappointments over the past 50 years and leads to real

concern that the Millennium Development Goal (MDG) for Safe Water may not be met. To achieve the MDG for Safe Water will require that nearly 300,000 new people receive access to water each and every day between now and 2015. Even if this daunting goal is met, half of the world's population in need, will remain without access to improved water supplies. The SWS is one of several point of use water treatment interventions that could help protect health now while the world community toils to meet the Millennium Development Goal for Safe Water. Delivery of low cost interventions like the SWS, however, remains challenging because of scarce development dollars. Innovative product delivery schemes like the one analyzed in this paper offer a promising approach for providing access to needed health interventions to protect the health of vulnerable populations now. Further research into how best to manage costs to maximize benefits, including a consideration of acceptable levels of subsidy, should be a priority of policy makers and project stakeholders.

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