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Economic Evaluation

Cost-Effectiveness Analysis of Community Case Management of Childhood Diarrhea in Burundi

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ABSTRACT

Objective: This study aimed to evaluate the cost-effectiveness of community case management (CCM) program of childhood diarrhea by providing oral rehydration salts and zinc through community health workers in Burundi.

Methods: A cost-effectiveness analysis study using a Markov modeling approach was undertaken to assess the CCM program of diarrhea from both provider and societal perspectives. The CCM program was compared with the routine management of childhood diarrhea at health facilities. Primary data on the cost of childhood diarrhea management were collected. Both economic and health outcomes were assessed for a period of 5 years, and a discount rate of 3% was applied. One-way and probabilistic sensitivity analyses were performed.

Results: The CCM program was found to be both less costly and more effective resulting to a negative value of incremental cost-effectiveness ratios, indicating that the program was dominant producing cost savings. Compared with the routine treatment of diarrhea at health facilities, the CCM program would avert 2749 additional disability-adjusted life years over a period of 5 years. The economic burden was reduced of US$1 056 699 and US$2 328 531 from the provider and societal perspectives, respectively. The cost-effectiveness estimates were mostly sensitive to the discount rate and the cost of outpatient visits at health facilities. The intervention remained dominant with a 100% probability of cost savings within 10 000 simulations of the sensitivity analysis.

Conclusions: Providing inexpensive diarrheal treatment (oral rehydration salts and zinc) in communities is an attractive cost-effective intervention. Evidence from this study should be used to scale up the coverage of this life- and cost-saving intervention.

Keywords: Burundi, community-based intervention, cost-utility, diarrhea, economic evaluation.

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Introduction

Diarrhea is one of the major child public health problems worldwide.[1–3] In 2017, approximately 1300 children globally died of diarrhea every day, making it the second leading cause of mortality among children under the age of 5 years.[2,3] Low-income countries in sub-Saharan Africa and South Asia are disproportionately affected by diarrhea-related mortality.[2,4] In Burundi, a country in the sub-Saharan African region, diarrhea comes in the third place among the top killers of children under the age of 5 years.[5] The death toll owing to diarrheal disease of Burundian children under 5 years of age was estimated to be 3063, or 7 deaths per 1000 livebirths, in 2016.[2] Not only is the clinical burden of diarrhea substantial to society, but diarrheal disease is also a barrier to development. For instance, in 2015, in developing countries, the average societal cost of diarrhea was estimated to be 36.56 US dollars (US$) for outpatient visit, whereas the estimate for inpatient department (IPD) admission was US$159.90.[6] Compared with average revenue, the admission cost per episode represents more than one half of the gross domestic product (GDP) of Burundi, which was estimated to be US$261 in 2019.[7]

Inadequate treatment of diarrhea, which is often caused by financial issues, geographic inaccessibility to well-equipped health facilities, and shortage of qualified health professionals and essentials drugs, is one of the risk factors of diarrhea-related mortality.[1] Dehydration is a potentially fatal complication of untreated diarrhea and often leads to death when patients have not been treated in a timely manner.[3,8] Therefore, it is strongly recommended to provide prompt rehydration therapy to patients with diarrhea. Nevertheless, access to timely treatment at health facilities remains challenging in developing countries.[1]

Although the World Health Organization (WHO) and the United Nations International Children's Emergency Fund (UNICEF) have been recommending the treatment of diarrhea with oral rehydration salts (ORS) and zinc since 2004,[9] the proportion of patients with diarrhea who receive adequate diarrheal treatment remains low. The global ORS coverage is estimated to be only 44% of patient with diarrhea under the age of 5 years. The proportion

of patients who received the recommended treatment of ORS and zinc is only 14%.[2] In Burundi, the proportion of patients with diarrhea who receive the recommended diarrhea treatment (ie, ORS and zinc) is quite far below the global average. From the recent Burundi Demographic and Health Survey (DHS), the proportion of children with diarrhea who received ORS and zinc was estimated to be 6% in 2016.[10]

To provide timely treatment of diarrhea, Burundi recently adopted the community case management (CCM) program of childhood diarrhea.[11] The program seeks to provide the treatment of diarrhea using ORS and zinc as early as possible by community health workers (CHWs) at the onset of the diarrheal episode for mild to moderate cases of patients under the age of 5 years. The effectiveness of such programs has been proven in various regions. Diarrhea-related dehydration, hospitalizations, and death rates were significantly reduced in communities where the program was promoted.[12,13] Nevertheless, there is a lack of evidence on the cost-effectiveness of this emergent health intervention in communities, which is currently being implemented in some pilot health districts in Burundi. This study aimed to analyze the cost-effectiveness of the CCM program of diarrhea in Burundi.

Methods

Study Design

The study was designed to include a cost-effectiveness analysis from both provider and societal perspectives. A Markov modeling approach was chosen for this study. The CCM program of diarrhea was compared with the current management of diarrhea at health facilities. The program targets children under the age of 5 years because the risk of diarrhea is very high among children up to 5 years of age.[11] Therefore, a time horizon of 5 years was set for this analysis similarly to previous studies[14,15] because the effect of the treatment with CCM program does not last long.

Description of the Intervention

Under the CCM program,[11] the CHWs, who are the village health volunteers, are trained to provide primary treatment for diarrhea, pneumonia, and malaria in children under the age of 5 years. The program initially started in 2011 within 3 health districts and included only malaria. Diarrhea and pneumonia were later introduced in 2014 as the program was expanded to 6 health districts. Furthermore, the coverage of the program was projected to increase by 5 health districts annually until 26 of 46 health districts in the country were covered in 2018. Regarding diarrhea, the program is intended to provide early treatment within the community at the onset of diarrheal disease. Therefore, with this program, the proportion of cases of moderate and severe diarrhea, which often become complicated with dehydration and can lead to death, are expected to reduce in accordance with the program effectiveness. The primary treatment of ORS and zinc provided by the CHWs is for mild symptoms without dehydration. A patient with diarrhea at the age of 2 to 11 months receives 1 packet of ORS per day for 3 days and half a tablet of 20 mg of zinc per day for 10 days, whereas those at the age of 1 to 5 years receive 1 packet of ORS per day for 3 days and 1 tablet of 20 mg of zinc per day for 10 days. A patient with diarrhea at the age of less than 2 months, a patient with bloody diarrhea, or a dehydrated patient is referred to a health facility for advanced medical care. The supervision of the program is done on a quarterly basis by a health professional, either a nurse or health promotion technician from the health center. The management and funding of this program are jointly assured by the government and its health partners. The government provides salaries to the civil servants responsible for the program management and supervision. Health partners provide the CHWs' incentives and medicines. Other details on the program management and organization can be accessed in the report published online.[11]

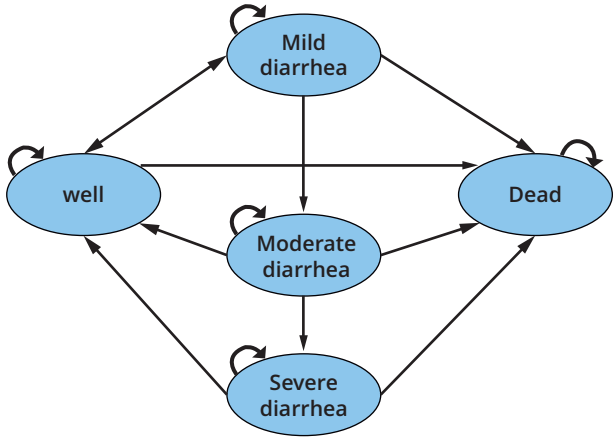
Comparator

The routine management of diarrhea at health facilities was used as a comparator to assess the efficiency of the CCM program of diarrhea. There is no strict national guideline for the management of diarrhea in Burundi, and, therefore, resources used can vary widely from 1 health facility or clinician to another. The management pattern and resource use were determined through our primary survey.

Model, Assumptions, and Transitional Probabilities

A Markov model was constructed to mimic the natural history of the disease on the basis of previous studies.[14,15] Diarrheal diseases can reoccur several times, especially in children under the age of 5 years, who are most vulnerable to diarrhea. In our model, as illustrated in Figure 1, we assumed that every type of diarrhea will start in the mild state. Patients with mild diarrhea may recover, persist with mild diarrhea, develop moderate diarrhea, or die. Patients with moderate diarrhea may recover, persist with moderate diarrhea, develop severe diarrhea, or die. Patients with severe diarrhea may recover, persist with severe diarrhea, or die. Therefore, early treatment with ORS and zinc provided in communities will reduce the number of cases of moderate and severe diarrhea, which often become complicated with dehydration and can lead to death if it is not treated in a timely manner. From our primary investigation and in agreement with literature review,[16] the average duration of a diarrheal episode was estimated to be 7 days. Therefore, the cycle length was set at 1 week, similar to previous studies.[14,15] From the DHS, the incidence rate was estimated to be 3.9 episodes per person-year.[10] Therefore, we allowed in our base case analysis a child to develop up to 3.9 episodes per year. An estimated diarrhea-specific mortality rate of 7 per 1000 livebirths was used in our analysis, in accordance with a UNICEF report for Burundi.[2] The probability of contracting diarrhea was estimated from the Burundi DHS,[10] whereas the transitional probabilities among different health states were derived from literature review.[16] To convert different data obtained from literature to a probability

Figure 1. Model structure.



we applied the formula: P (probability) = $1\text{-}e^{-rt}$, where e is the exponential function, r is the rate, and t is the time.[17] The results of various epidemiological parameters included in the analysis are provided in Table 1.

Effectiveness of the Intervention

The effectiveness of the CCM program of childhood diarrhea in Burundi was estimated using the DHS in 2016.[10] The proportions of children with diarrhea who received ORS or zinc were estimated to be 36% and 15%, respectively. According to the same survey, healthcare was sought for 59% of all patients with diarrhea. Therefore, for our base case analysis, we considered a coverage rate of 36%, whereas coverage rates of 15% and 59% were used for the lower and upper bounds in the sensitivity analysis.

Previous studies revealed that diagnosing, treating, and monitoring children with diarrhea do not require the use of sophisticated equipment, testing, or health facilities.[12] Trained villagers can easily and effectively diagnose, treat, and monitor children, using ORS and zinc until recovery or sending children to nearby health facilities for advanced care or hospitalization as required. Therefore, we assumed that mild to moderate diarrhea without dehydration can be as effectively treated by CHWs as by formally qualified health professionals at health facilities. Regarding the effectiveness data of ORS and zinc, a systematic review was conducted, because they were not available from country-specific settings. Several studies on the effectiveness of ORS and zinc were found. For each outcome and intervention, we prioritized the most updated comprehensive meta-analysis studies to derive data to include in our model. Therefore, the effectiveness of ORS was derived from the study by Munos et al,[18] which was a meta-analysis of 157 randomized clinical trials. The effectiveness of zinc was obtained from the study by Walker et al,[19] which was a systematic review and meta-analysis of 13 randomized clinical trials conducted in low- and middle-income countries.

For this study, health outcomes were valued in terms of disability-adjusted life years (DALYs). DALY was computed as the summation of years of life lost owing to premature death and years of life lost owing to a disability.[24] The number of years of life lost owing to premature death was computed by multiplying the number of deaths by the standard life expectancy at the age of death. The number of years of life lost owing to a disability was obtained by multiplying the number of episodes by disability weight and average duration of the episode. A discount rate of 3% was applied to discount future health outcomes.[23] Disability weights were taken from the global burden of disease study.[20] From our primary investigation, a diarrheal episode lasted 6 days and 9 days for an outpatient visit and inpatient admission, respectively. Regarding the duration of mild diarrhea, because we could not estimate the duration for the type of mild diarrhea occurring in communities, we assumed one-half of the average duration of an outpatient episode (ie, 3 days).

Cost Measurement

Regarding the cost of the CCM program, costs were derived from the report of the pilot district.[11] The costs were composed of cost of medicines and cost of service delivery. The cost of medicines used in the program (ORS and zinc) was estimated based on their actual price at public health centers. The cost of service delivery included costs associated with program management, supervision, meetings, and refresher training sessions. The largest driver of cost in the CCM program was the service delivery cost, representing 68% of the total program cost.

For the cost of the current management of diarrhea in health facilities, we collected primary data on the cost of diarrheal management for a total of 138 patients under the age of 5 years who presented with acute non-bloody diarrhea as the primary complaint at the Buyenzi health center (primary care) and the Prince Regent Hospital (tertiary hospital) from November to December 2019. Data collected included direct medical cost (drugs, investigation, and routine services costs) and direct nonmedical cost (transportation, meals, accommodation, informal care, and extra diaper-related costs). Direct non-medical costs for the whole episode and direct medical costs incurred before and after admission or visit were collected through interview with patients' caregivers, whereas direct medical costs incurred during visit or admission were collected through a review of medical records. Unit costs of outpatient visits and bed-day were derived from WHO-CHOICE,[25] whereas the unit costs of drugs and of laboratory tests were obtained from health facilities' procurement cost and private market cost, respectively. To calculate the cost of informal care, the human capital approach was employed. Therefore, a daily per capita gross national income was multiplied by the total number of days lost by all patients' caregivers as obtained through our primary survey. During our primary data collection, episodes of diarrhea were categorized into 2 groups according to whether the episode of diarrhea was managed within outpatient department (OPD) or IPD. The total cost per episode of diarrhea managed within OPD and IPD was estimated by summing up unit cost multiplied by the quantity of each resource used per each service. Further details on the method of cost estimation can be accessed in the WHO guide, because the design of our study referred to this guide.[26]

All costs collected in Burundi Francs were converted to 2019 US$ using an exchange rate of 1846 Burundi Francs per US$1.[27] On the basis of WHO guidelines, a discount rate of 3% was applied to cost estimates in the base case analysis and a range of 0% to 6% was explored in the sensitivity analysis.[23]

Analytical Methods

We estimated the incremental cost-effectiveness ratio (ICER) per additional DALY avoided. ICER was computed as the difference in costs divided by the difference in health outcomes between current management of diarrhea at health facilities and management of diarrhea in the communities. The cost per episode of diarrhea at health facilities was calculated by summing up the cost of drugs and medical supplies, the cost of investigation tests, and the cost of routine services (ie, cost of bed-day for hospitalized cases or cost per visit for outpatient visits) from a provider perspective. For the societal perspective, in addition to the costs from the provider perspective, we included the cost of transportation, meals, accommodation, extra diapers, and informal care. The CCM program cost was composed of the cost of providing ORS and zinc to prevent the severity of the disease in the communities and the cost of management of moderate and severe cases at health facilities for patients not covered by the program or resulting from the treatment failure in accordance with the effectiveness of ORS and zinc. Therefore, from each cycle length of the model, a certain number of children of mild to moderate diarrhea cases were given ORS and zinc according to the program coverage. The number of mild to moderate cases was multiplied by the unit cost per child treated in the communities adjusted by the coverage rate. Then, we calculated the cost of patients who would consult the outpatient and IPDs of the health facilities. We summed up then the 2 costs to get the total cost of the program. Because there is no specific cost-effectiveness threshold for Burundi, the WHO criterion for cost-effectiveness threshold was applied.[23] ICER per DALY averted was compared

Table 1. Parameters included in analysis.

Parameter description	Baseline	Distribution	Range		Source
			LL	UL	
Transitional probabilities (weekly)					
Well to mild diarrhea	0.072	β	0.058	0.087	10
Mild diarrhea to moderate diarrhea	0.043	β	0.034	0.051	10
Moderate diarrhea to severe diarrhea	0.009	β	0.007	0.011	16
Persistence of mild diarrhea	0.025	β	0.020	0.030	16
Persistence of moderate diarrhea	0.080	β	0.064	0.096	16
Persistence of severe diarrhea	0.057	β	0.046	0.069	16
Diarrhea to death	0.00013	β	0.00011	0.00016	2
Effectiveness parameters (relative risk)					
Efficacy of ORS	0.2387	Lognormal	0.2	0.49	18
Efficacy of Zinc	0.77	Lognormal	0.69	0.85	19
Program coverage	0.36	Constant	0.15	0.59	10
Costing parameters (value in 2019 US$)					
Cost per child treated in community	1.91	γ	1.53	2.29	11
Cost of diarrhea in OPD, societal perspective	9.77	γ	7.51	10.95	Primary data
Cost of diarrhea in OPD, provider perspective	5.49	γ	4.39	6.40	Primary data
Cost of diarrhea in IPD, societal perspective	99.90	γ	61.01	121.29	Primary data
Cost of diarrhea in IPD, provider perspective	69.49	γ	40.53	75.61	Primary data
Cost of mild diarrhea	1.08	γ	0.86	1.29	Primary data
Disability weights					
Disability weight mild diarrhea	0.074	β	0.049	0.104	20
Disability weight moderate diarrhea	0.188	β	0.125	0.264	20
Disability weight severe diarrhea	0.247	β	0.164	0.348	20
Duration of morbidity; mild (days)	3	γ	2	4	Primary data
Duration of morbidity; outpatient (days)	6	γ	5	7	Primary data
Duration of morbidity; hospitalization (days)	9	γ	7	12	Primary data
Other parameters					
Life expectancy	60		n/i	n/i	21
Birth cohort (2019)	522 873	Constant	n/i	n/i	22
Outcome discounting rate	0.03	Constant	0	0.06	23
Cost discounting rate	0.03	Constant	0	0.06	23

n/i indicates not included; OPD, outpatient department; IPD, inpatient department; LL, lower limit; UL, upper limit.

with the Burundi GDP (GDP = US$261) per capita.[7] An intervention is considered highly cost-effective if ICER is below 1 GDP per capita and cost-effective if ICER is between 1 and 3 GDP per capita.

Sensitivity Analysis

To explore parameter-related uncertainty that may affect ICER, a 1-way sensitivity analysis was performed. The 95% confidence limits were used for parameters obtained from primary investigation and literature review when reported. Regarding parameters for which 95% confidence limits were not reported, a reasonable variation of ±20% of the mean was explored. The results of the 1-way sensitivity analysis were presented using a tornado diagram.

A probabilistic sensitivity analysis, using a Monte-Carlo simulation of 10 000 iterations, was performed to explore the overall uncertainty surrounding the parameters included. The distribution for each parameter was chosen based on literature.[17] The results of the probabilistic sensitivity analysis were presented using the cost-effectiveness plane and the cost-effectiveness acceptability curve.

Results

Cost Estimates

The average cost of management of 1 episode of diarrhea at health facilities was estimated to be US$25.19 and US$38.45 from

Table 2. Results of the cost-effectiveness analysis.

Outcome and perspective	Routine treatment	CCM
DALYs lost	37 160	34 411
Incremental DALYs averted	n/a	2749
Provider perspective		
Total cost	2 281 009	1 224 310
Incremental cost	n/a	−1 056 699
ICER	n/a	Dominant
Societal perspective		
Total cost	12 652 984	10 324 453
Incremental cost	n/a	−2 328 531
ICER	n/a	Dominant

CCM indicates community case management; DALY, disability-adjusted life year; ICER, incremental cost-effectiveness ratio; n/a, not applicable.

the provider and societal perspectives, respectively. In general, direct medical cost accounted for the largest part of total cost (70.86%) and the biggest driver of direct medical cost was drugs and medical supplies cost (59.2%). From the societal perspective, the costs of management of a diarrheal episode within outpatient visit and IPD were US$9.77 and US$99.90, respectively. From the provider perspective, the costs of outpatient visit and IPD per episode of diarrhea were US$5.49 and US$69.49, respectively.

Regarding the cost of the CCM program, as estimated from the report, the average recurrent cost per child and for 3 diseases (diarrhea, pneumonia, and malaria) of the program was US$5.96, of which 35% was the cost of the medicines and medical supplies. Other cost components were the cost of the program management, supervision, meetings, and refresher training sessions, and other in the proportions of 7%, 29%, 22%, 5%, and 1%, respectively. To estimate the cost of service delivery, we subtracted the costs of medicines and medical supplies and then divided by 3. Therefore, the cost of service delivery per 1 disease was estimated to be (US$5.96 × 0.65)/3 = US$1.29. The cost of diarrhea medication (3 packets of ORS and 10 tablets of zinc) was estimated to be US$0.62. Therefore, the cost per episode of diarrhea managed in the community was estimated to be US$1.91.

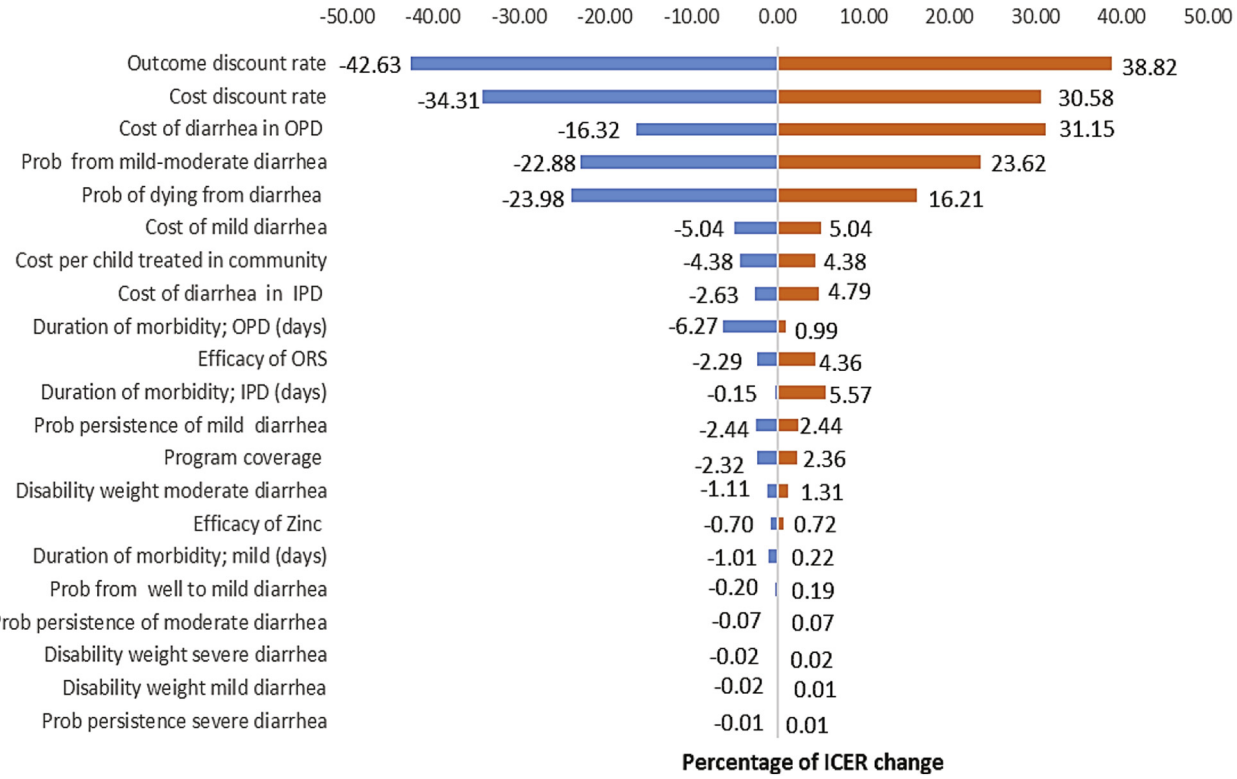
DALYs Estimates

Based on the 2019 birth cohort, our model predicted that there would be lost a total of 37 160 DALYs and 34 411 DALYs after a period of 5 years with the routine treatment and CCM program, respectively.

Base Case Analysis

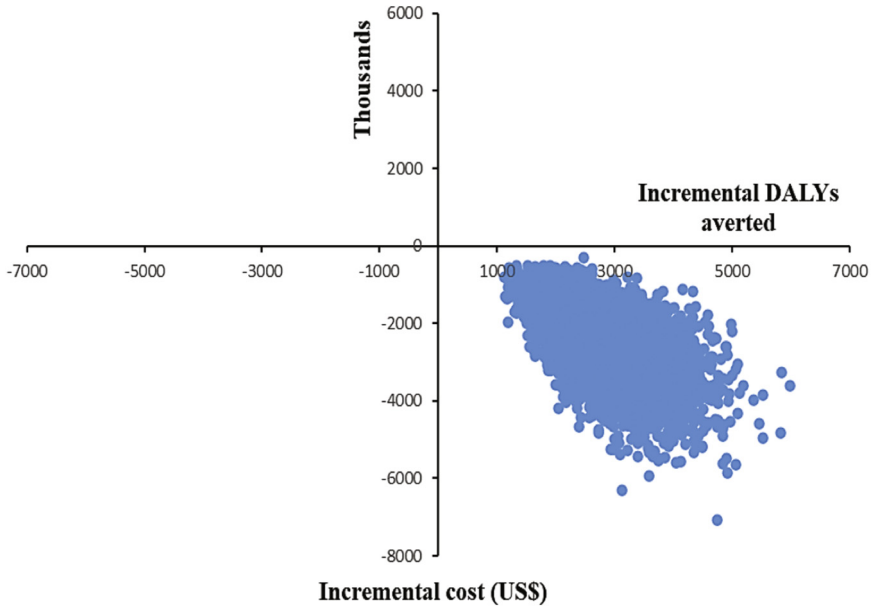
The results of the base case cost-effectiveness analysis are presented in Table 2. In the base case analysis, based on a birth cohort of 522 873 livebirths, the CCM program would avoid 2749 additional DALYs compared with the routine treatment at health facilities over a period of 5 years. With the CCM program, the total economic burden of diarrhea would decrease by US$1 056 699 and US$2 328 531 from the provider and societal perspectives, respectively. ICERs were negative for both the provider and societal perspectives, indicating that the program was cost saving.

Figure 2. Tornado diagram showing the results of the 1-way sensitivity analysis.



ICER indicates incremental cost-effectiveness ratio; IPD, inpatient department; OPD, outpatient department; Prob, probability.

Figure 3. Cost-effectiveness acceptability curve from probabilistic sensitivity analysis. DALY indicates disability-adjusted life year.



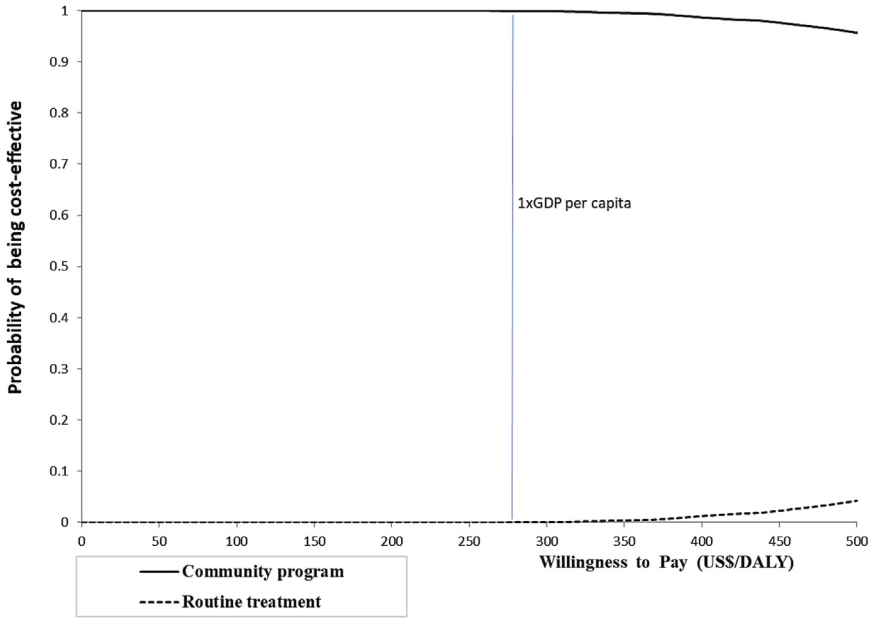
One-Way Sensitivity Analysis

As illustrated in Figure 2, the results of the 1-way sensitivity analysis showed that our cost-effectiveness estimates were more sensitive to outcome discounting rates. Without a discounting rate, ICER decreased by 42.63% (ICER = -US$485 per DALY avoided), whereas applying a 6% discount rate increased ICER by 38.82% (ICER = -US$1173 per DALY avoided). Therefore, it is important to note that the extreme variation of all parameters remained in favor of the dominance of the CCM program. The other parameters that affected ICER by more than 10% were cost discount rate, cost of diarrhea in the OPD, probability of progressing from mild to moderate diarrheal states, probability of dying from diarrhea, and cost of mild diarrhea.

Probabilistic Sensitivity Analysis

As illustrated in the cost-effectiveness plane (Fig. 3), the CCM program remained dominant (ie, the program was associated with a high effectiveness and low cost) in all 10 000 simulations. Figure 4 further illustrated different probabilities of being cost-effective at different willingness-to-pay thresholds. At a willingness-to-pay

Figure 4. Cost-effectiveness acceptability curve from probabilistic sensitivity analysis.



DALY indicates disability-adjusted life year; GDP, gross domestic product.

equal to 1 time the Burundi GDP per capita, the results from 10 000 simulations indicated that the probability of being cost-effective was 100%. This result emphasizes that the CCM program still dominates the routine management of diarrhea at health facilities even in the pessimistic scenario of all model input parameters.

Discussion

Our study estimated the cost-effectiveness of the CCM of childhood diarrhea in Burundi. To reach our goal, a Markov model was built. As previously proven in a study conducted in Nigeria[14] and Tanzania,[15] our constructed model had the ability to mimic the natural history of the disease and capture all required effects of our intervention. For model input parameters, we strived to use certain country-specific estimates from either reliable evidence of the literature or our primary survey. Nevertheless, where it was not possible to get specific parameters, evidence from meta-analysis studies was used as the most reliable data.

Findings from our analysis proved that the CCM program is cost saving. All estimated ICERs per DALY avoided that were evaluated from all scenarios analyzed were below zero, indicating that the intervention remained consistently cost saving even with extreme variation of included parameters. The probabilistic sensitivity analysis indicated that the program was cost-effective with a probability of 100% at 1 GDP per capita, confirming that there would be no additional cost for the program.

In the literature, there is scarce evidence on the cost-effectiveness of diarrhea management using the recommended treatment (ORS and zinc) in community-based interventions. A previous study in India evaluated the cost-effectiveness of diarrhea alleviation through zinc and oral rehydration therapy in rural areas. The study found that the intervention was very cost-effective.[28] Community-based programs were also found to be cost-effective in Ghana for 3 diseases (diarrhea, malaria, and pneumonia)[29] and in Uganda for malaria.[30] Other studies on the cost-effectiveness of zinc supplementation in other developing countries found the intervention to be cost saving in India,[31] in the Philippines,[32] and in Colombia.[33]

Even though UNICEF and WHO have recommended the use of ORS and zinc to treat acute non-bloody diarrhea since 2004, the coverage of these life-saving and cost-effective medicines remains challenging in Burundi. The proportion of children who received the recommended diarrheal treatment was estimated to be 6%.[10] Therefore, the implementation of this community program may help to scale up the coverage rate of the recommended treatment of ORS and zinc, resulting in a decrease in the risk of severe health consequences of chronic diarrhea and stunting, acute diarrhea, and zinc deficiency among children and decrease of hospitalizations owing to diarrhea and the reduction of inappropriate antibiotic prescription and use.

Currently, the CCM program is mainly funded by health partners of the Burundi Government.[11] Therefore, although not expensive, the sustainability of this relevant program is questioned. To ensure the sustainability of this program, a long-term budget plan must be prepared.

In addition, this intervention would contribute to ensure equity in child healthcare access in the health system of Burundi, which is currently facing a certain number of challenges such as shortage of qualified health professional and health facilities infrastructure aggravated by inequitable geographical distribution and low access to electricity and proper water supply.[34] Once effectively implemented, the CCM program would enable poor children in rural and remote areas to access effective diarrheal treatment.

Like other studies, our study has some limitations. First, the evaluation of the CCM program was restricted to 1 disease even though there are other diseases included in the program. Second, owing to a lack of specific estimates, some of the model input parameters were borrowed from other countries. Third, even though our cost estimates were adjusted to be more representative of the whole country, the values were derived from a limited number of health facilities. Finally, our analysis did not consider the indirect effect of the role of CHWs in the prevention of diarrhea. We believe that CHWs may provide health education more clearly and concisely while they treat children, which health professionals at health facilities might not be able to do.

Conclusion

Evidence from this study brings to light the efficiency of the CCM program of diarrhea in Burundi. Not only would the clinical burden of diarrhea be reduced, but the economic burden of diarrhea could also be reduced for both the society and the provider. The program, once effectively implemented, could help to scale up the coverage of proven cost-effective and life-saving diarrheal treatment, while also contributing to child healthcare equity for all Burundian children. A long-term financing plan should be prepared to ensure sustainability of this attractive and cost-saving intervention. Therefore, policymakers should prioritize and promote this community-based intervention, because it is proven to reduce both clinical and economic burden without requiring an exorbitant budget.

Article and Author Information

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Ethical Approval: Because this study was a part of a graduate study program, the study was approved by the Institutional Review Board of the Faculty of Dentistry/Faculty of Pharmacy, Mahidol University (COA.No.MU-DT/PY-IRB 2019/070.1010). It was also approved by the study sites. All participants were given an informed consent form to sign once they agreed to participate in our study.

Availability of Data and Materials: The datasets used and analyzed during the current study are available from the corresponding author on reasonable request.

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