Cost-effectiveness of Performance-based Non-financial Incentive (PBNI) intervention to improve health information system performance at Wogera District in Northwest Ethiopia.

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Abstract

Introduction: Several behavioral and moral factors influence health information use and practice, including healthcare motivation. A performance-based non-financial incentive (PBNI) intervention was developed to improve the quality of data and information use practices in the Wogera district.

Objectives: This research aimed to assess the cost-effectiveness of PBNI interventions to improve data quality and information use practices in Northwest Ethiopia.

Methods: In the northwest Ethiopian districts of Wogera (the intervention site) and Tach-Armachiho (the comparison site), a quasi-experimental study was carried out. The study included health centers, departments, and health professionals. Six health centers and health professionals working at the health centers were included. PBNI intervention, including different motivation packages, was implemented at Wogera district health facilities. Before and following the intervention, the Wogera and Tach-Armachiho districts' performance in terms of health information was evaluated. The cost of the intervention was estimated using an activity-based, bottom-up approach. Calculations were made to determine the incremental cost-effectiveness and average cost-effectiveness ratio.

Result: The study enrolled eighty-six study departments. Of these, 42 (48.8%) were from Wogera district. In comparison to the comparative group's 52,078 ETB, the average cost-effectiveness ratio for the PBNI intervention was 20,970 ETB per unit percentage improvement in HIS performance. But the incremental cost-effectiveness ratio (ICER) for PBNI intervention showed 10,600.5 ETB/percentage point HIS performance improvement.

Conclusion: The performance of the health information system in healthcare institutions was improved through the integration of PBNI with implementation packages for health information. Therefore, PBNI should be designed as one motivational strategy by the health institutions to incentivize health providers to improve data quality and evidence-based decision-making with limited resources. [*Ethiop. J. Health Dev.* 2023;37 (SI-1)]

Keywords: Health information system, performance-based non-financial incentive, CEA, ICER

Introduction

Ethiopia has been implementing multiple strategies for a decade to enhance the performance of health information systems (HIS) at different levels. Advances in data collection, aggregation, analysis, and reporting are just a few of the actions that need to be taken. Besides, promoting the culture of evidence-based decision-making; utilizing information communication systems, data visualization, and access; addressing the human element; bolstering verification and feedback systems; and multi-sectoral approaches (1-3).

Ethiopia has built a health management information system at all levels of the healthcare delivery system to ensure the information is used for evidence-based planning and decision-making (4). One of the contributing elements to the lack of information utilization in evidence-based planning, performance monitoring, and evaluation is poor employee motivation. Staff motivation is one strategy to improve data quality and information used on the Health Information Revolution Roadmap. However, several internal or external issues in the health system pose challenges to information consumption. Quality health data should have been utilized in the health system, which is proven to save millions of lives (5). The use of healthcare data couldn't be improved despite numerous attempts, and depending on the status quo may not be very effective in addressing the stated problems. (6).

Theoretically, it is known that motivating and incentivizing staff enhances their performance and improves service outcomes. According to a study, motivating employees to improve health outcomes is becoming a more crucial quality in low- and middle-income countries (7). Motivation is a behavioral or

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moral factor affecting information use practices in Ethiopia's health care delivery system (2).

A performance-based non-financial incentive intervention is a bundle of interventions containing different components to increase data use coverage in the intervention district. It has been shown in numerous research that encouraging healthcare improvement has a major impact. A strong incentive enhances quality health care (8), and financial incentives affect patient-centered and reporting progress (7), quality improvement in health care delivery (9), improvements in coverage and quality of patient care (10), the quality of care provided to diabetic patients (11), processes of care or hypertension-related clinical outcomes (12, 13), improving reproductive health behaviors and status to service quality (13) and improvement of the quality of health care (14).

When scarce resources are used to implement more affordable interventions, health outcomes increase more. Cost-effectiveness analysis helps with numerous crucial policy-making tasks (15, 16).

Cost-effectiveness analysis helps identify ways to redirect resources to achieve more. It demonstrates the utility of allocating resources from ineffective to effective interventions and from less effective to more cost-effective interventions (17, 18). However, the efficacy of PBNI in improving HIS performance has not yet been evidenced in our understanding. As a result, this study assessed the cost-effectiveness of the PBNI intervention in improving HIS performance.

Methods

Study Design and Period

A quasi-experimental study design was utilized to assess the cost-effectiveness of the PBNI intervention for HIS performance improvement between October 2020 and July 2021.

Study setting (Intervention and comparison sites)

***Intervention site*:** - The PBNI intervention was implemented in the Wogera district. The Wogera district is in the Central Gondar Zonal Health Department, Northwest Ethiopia. The district comprises 51 Kebeles and has a total population of about 278,942. One primary hospital, eight health centers, and 44 health posts provide preventive, promotional, and curative services. The health workforce has 108 health extension workers, 678 health workers, and 215 support staff.

***Comparator site*:** Tach-Armacheho district was chosen as a comparison for intervention because it is located in the same catchment as the Central Gondar Zonal Health Department. There are 24 kebeles in the district, which has 121,321 inhabitants. One primary hospital, six health centers, and 28 health posts exist. In addition, there are 53 health extension workers, 202 health workers, and 141 support staff.

These sites were selected purposefully because of their similarity to the HIS program interventions. Both were Capacity Building and Mentorship Program (CBMP) intervention sites. Additionally, the intervention was designed based on the operational research findings done at Wogera and Tach districts, which showed incentive as a key determinant for HIS performance (19). Six health centers, operational departments, and health professionals in the Wogera and Tach Armachiho districts were included. Except for two (Jankel and Mereba) in the Wogera district due to security issues, all health centers were included in the study.

Description of the Intervention

PBNI intervention is a motivation strategy implemented at the health center, case team, and individual level to create a conducive and competitive work environment and enhance data quality and information practice.

The intervention was created in partnership with the FMOH, Amhara Regional Health Bureau, Central Gondar Zone, and Wogera district by the University of Gondar (e-Health Lab). The intervention was designed based on the operational research conducted in the Wogera district, which showed that a non-incentive contributed significantly to poor individual, interpersonal, and organizational data quality (19). The PBNI package is mainly designed to improve the level of data quality and the culture of information use for evidence-based decision-making among health workers and managers in the health centers of the Wogera District.

The specifications of the incentive package included;

Award/reward: Providing performance-based non-financial incentive intervention awards that were prepared and decided by implementers in the district.

- Certification: Those who score high get public recognition from higher officials (UoG, zonal, regional, and MoH).
- Scholarship: Scholarship opportunities were offered to a high-performing individual in the district at the leading university in collaboration with the Ministry of Health (MoH). The scholarship would include all healthcare professionals, including health extension workers.
- Promotion: A high-performing healthcare provider could get a chance to upgrade to a higher level within the organization.

The approach to getting the best-performing individuals, departments, and health facilities comprised subjective (phase I) and objective (phase II) techniques. The subjective approach was conducted by asking relevant people about the performance of individuals, departments, and facilities. The information was obtained from district health office managers, middle and lower-level health facility managers, and department heads. This subjective approach helped minimize the number of potential awardees so that we could be focused and cost-effective in implementing phase II, or objective approaches. Following the subjective selection of potential winners, the greatest performers were found objectively by quantitatively analyzing his/her work or performance. In the first phase, or subjective approach, individuals, departments, and health facilities were screened, and only those who substantially performed were identified. Thus, the second phase examined the performance of the screened nominees using data to determine the best performers for the award.

Outcome Measurement

Data Quality performance measures: The levels of data quality were quantified using various data quality parameters, such as accuracy, reporting timeliness, and completeness.

***Completeness*:** This was measured by reviewing the relevant data elements of the selected indicators and medical records. The content and data element completeness were checked from the source documents or registers by taking 15% of the recordings from each month.

Consistency: Internal consistency was determined by comparing the reported value of an indicator for a selected reporting period to recorded data by reviewing the source document for the same facility and period. Furthermore, the consistency of data items between the register and IMRs archived at MRU was verified.

***Timeliness*:** It was evaluated by comparing health facilities' actual reporting periods set by the national HMIS guideline.

Finally, the scores from the three dimensions were combined to create a single index called data quality, with timeliness and completeness receiving 30% of the weighting and consistency receiving 40%.

***Information Use*:-** HMIS reports, electronic databases, planning documents, meeting minutes, feedback reports and notes, and guidelines were used to assess the level of information use. Data visualization practice, HMIS analytic report production, LQAS performance, PMT functionality, internal monitoring by the health center, and external report dissemination practices were measured by reviewing relevant documents.

The district-level average data quality and information use scores were measured before the study's initiation in both districts and captured at the intervention's end. The outcome variable for the intervention (HIS performance) was calculated from the data quality and information use variables. The study's success was judged by two indicators: data quality and information utilization. The district average data quality and information use scores were calculated. Finally, the data quality and information use scores generate a single index indicator called "HIS performance." The final HIS performance score was calculated by weighting data quality at 30% and information utilization at 40%, then converting the value to 100%. This is because HIS performance is assessed using three domains: data quality, information use, and HIS infrastructure, which accounts for 30, 40, and 30 percent, respectively. But, since the intervention targets only data quality and data use domains and data is collected from these domains, their score was estimated at 100% without considering the infrastructure section.

Cost Analysis

Perspective and time horizon

The cost of this study was estimated from the provider perspective (health system) with district-level intervention. Furthermore, the cost data were gathered retrospectively.

Cost Analysis Approach and costing assumptions:

The common resources utilized for health data management, like registers, computers for smart care, and DHIS-2, were deemed equal at the intervention and comparison districts and assumed no cost difference. An activity-based bottom-up costing approach was used to identify and measure the costs incurred for implementing the intervention. First, the activities are completed, and the resources consumed are identified. Then the monetary value of the activities and the resources consumed were calculated. The intervention and comparison districts' data quality and information activities were identified during the six-month (April to August 2021) intervention period. The monetary value of all resources used in each activity was calculated in Ethiopian Birr and USD. Research costs were excluded from the cost estimation (Table 1).

Table 1**: Description of cost centers and sources for CEA of PBNI intervention at Northwest Ethiopia 2021.**

No	Cost centers	Description	Data source
1.	Training	Personal and refreshment costs incurred for health professionals' capacity building on data quality, information use, and integrated DHIS-2.	Key informant interviews with administrative and program staff. Review of training plans and budgets, and administrative and financial documents
2.	Supervision	Personal and transportation costs incurred for conducting supervision for the health facilities.	Key informant interviews with administrative and program staff. Review of M&E plan documents
3.	Mentorship	Personal and transportation costs incurred for conducting mentorship for the health facilities.	Key informant interviews with administrative and program staff. Review of M&E plan documents
4.	Review meeting	Personal and refreshment costs incurred for conducting HIS review meetings	Key informant interviews with administrative and program staff. Review of M&E plan documents
5.	In-kind reward	Costs incurred for preparing reward packages in the intervention site	Key informant interviews with administrative and program staff. Intervention implementation follow-up documents.
6.	Data day event	Costs incurred for refreshments, brochure preparation, and per diem for participants	Key informant interviews with administrative and program staff. Intervention implementation follow-up documents.

Data collection

At the beginning and end of the intervention period, data on effectiveness were obtained using a standardized and pre-tested tool. The tool was developed to assess facilities' data quality and information practice in two districts.

Cost data were extracted from various administrative and financial records, administrative and program staff interviews, and other pertinent papers using a cost extraction sheet. The cost-tracking tool was developed by considering the detailed activities of the intervention and the comparison district.

Data Analysis and Sensitivity Test

Estimates of HIS performance were calculated to compare the performance of PBNI intervention with the comparator group. The anticipated cost per HIS performance was used to compute the incremental cost-effectiveness ratio (ICER) for the PBNI versus the comparator. Microsoft Excel analyzed the program cost, effectiveness, ACER, and ICER results. The cost-effectiveness ratio was computed using the average cost per HIS performance.

After each option's total costs and benefits were measured, average cost-effectiveness ratios (ACERs) (20) were calculated to decide which alternative to choose. Assuming PBNI intervention as "alternative A" versus a district without PBNI intervention as" alternative B," the comparison takes the following form:

Average Cost-Effectiveness Ratio (ACER):

$$\text{ACE}R(B) = \frac{Total\ cost\ for\ B}{HIS\ performance\ for\ B}$$

$$\text{ACE}R(A) = \frac{Total\ cost\ for\ A}{HIS\ performance\ for\ A}$$

The incremental cost-effectiveness ratio (ICER) was computed to compare the incremental costs to the incremental benefits and identify the incremental costs required to enhance the HIS's performance by a single unit (21).

$$ICER(A-B) = \frac{(Cost\ A - Cost\ B)}{(Effectiveness\ of\ A - Effectiveness\ of\ B)}$$

Where B and A denote mean cost and mean effectiveness.

The uncertainty of the result was managed by calculating the input costs rather than estimating them. In addition, a one-way sensitivity analysis was done using a common mentorship approach regarding frequency and per diem rate. Furthermore, a three-way sensitivity analysis was performed under the assumption that the training would be delivered at the University of Gondar, with a similar frequency of mentorship with a similar perdiem, and with the intervention being administered in its entirety.

Results

Participant Characteristics

Twelve health centers (six from each), Eighty-six departments, and 394 health professionals were enrolled in the study from the intervention and comparison districts. Of these, 42 (48.8%) were from the intervention district, and the rest were from the comparison district. In addition, 204 (21.8%) of the health professionals were from the intervention district.

After the intervention, the average information use score at the intervention site increased from 37% to 59%, however, it was 35% and 43% in the comparative district. The study showed a 22% and 8% change in the average information use score at the intervention and comparison districts after the intervention, respectively. The average data quality score increased from 46.7% and 100% in the intervention and 48.3% and 62.5% in the comparator district. The research finding showed a 53.3% and 14.2% improvement in the average data quality score at the intervention and comparison districts, respectively.

Average HIS performance score before and after intervention

The average HIS performance improved from 33.4% to 61.4% in the Wogera district and from 37.4% to 43.8% at the comparator site. **(Table 2)**

Table 2: **The average health information system (HIS) performance for CEA of PBNI intervention at Northwest Ethiopia 2021.**

District	Dimensions												
	Data quality (A)		Information use (B)		Data quality (C)		Information use (D)		Average HIS score				
	Average scores from 100%				Weighted score (30% (A) and 40% (B))				The average HIS score of 70%		Average HIS score from 100%		Percentage change in HIS performance (D) – (E)
	Before	After	Before	After	Before	After	Before	After	Before	After	Before (E)	After (D)	
Wogera	46.7	100	33.4	61.4	14.01	30	13.36	24.56	27.37	54.56	39.1	77.9	38.8
Tach Armachiho	48.3	62.5	37.4	43.8	14.49	18.75	14.96	17.52	29.45	36.27	42.1	51.8	9.7

Cost of the Intervention

The intervention cost was analyzed by considering the comparator and PBNI intervention activities. The calculated cost of the intervention for the six-month implementation was 813,635 ETB. The PBNI intervention's cost for only in-kind rewards and the data day event was 308,475 ETB. Furthermore, the cost for the comparator district during the intervention period was 505,160 ETB (Tables 3 and 4).

Table 3: **Cost of PBNI intervention at Wogera District Northwest Ethiopia 2021.**

Intervention District	**Wogera**						
Intervention type	**Performance Based non-financial Incentive (PBNI)**						
Duration	**6-month**						
Major activities done	**Item activities**		**Round**	**No participants**	**Unit cost**	**Total cost**	**Remark**
Training	Basic training on data quality and information use	Per diem for trainee	1	38	900	34200	
		Trainer	1	3	2250	6750	
		Refreshment	1	41	150	6150	
	Training on integrated DHIS-2	Per diem for trainee	1	33	3900	128700	
		Trainer	1	3	3900	11700	
		Refreshment	1	36	560	20160	
	Training on strategic problem-solving using RCA	Per diem for trainee	1	31	1200	37200	
		Trainer	1	3	2250	6750	
		Refreshment	1	34	150	5100	
	Training on PMT logbook application	Per diem for trainee	1	28	2600	72800	
		Trainer	1	3	2250	6750	

		Refreshment	1	31	300	9300
M&E	Supervision and follow-up	Per diem	3	5	4500	67500
		Transportation	3	1	4500	13500
	Mentorship	Per diem	3	3	6750	60750
		transportation	3	1	6750	20250
	Review meeting	Per diem for participant	2	33	1125	74250
		Facilitator	2	5	650	6500
		Refreshment	2	38	70	5320
Data day event	Brochure and banner preparation		3	5	375	5625
	Refreshment		3	33	70	6930
	Per-diem for participant		3	33	900	89100
In-kind reward	Individual	Certificate	3	9	50	1350
		Smartphone	3	3	6500	58500
		Power bank	3	3	2500	22500
		Flash-disk	3	9	400	10800
	Facility/case team	Certificate	3	18	50	2700
		Power bank	3	3	2500	22500

Table 4: **Cost of HIS implementation for the comparison group for CEA of PBNI intervention at Northwest Ethiopia 2021.**

Comparative District	**Tach Armachiho**							
Intervention type	**No intervention**							
Duration	**6-month**							
Major Activities	**Item activities**	**Items**		**Round**	**No. of participants**	**Unit cost**	**Total cost**	**Remark**
	Training	Basic training on data quality and information use	Per diem for trainee	1	32	1500	48000	
			Trainer	1	3	2250	6750	
			Refreshment	1	35	150	5250	
		Training on integrated DHIS-2	Per diem for trainee	1	24	2600	62400	
			Trainer	1	3	2700	8100	
			Refreshment	1	27	600	16200	
		Training on strategic problem-solving using RCA	Per diem for trainee	1	24	1200	28800	
			Trainer	1	3	2250	6750	
			Refreshment	1	27	100	2700	
		Training on PMT logbook application	Per diem for trainee	1	25	2600	65000	
			Trainer	1	3	2250	6750	
			Refreshment	1	28	300	8400	
	Mentorship	Supervision and follow-up	Per diem	3	3	5850	52650	
			Transportation	3	1	5850	17550	
		Mentorship	Per diem	3	3	8775	78975	
			transportation	3	1	8775	26325	
		Review meeting	Per diem for participant	2	24	1125	54000	
			Facilitator	2	5	650	6500	
			Refreshment	2	29	70	4060	

Average cost-effectiveness ratio (ACER) and incremental cost-effectiveness ratio (ICER)

Average cost-effectiveness ratio (ACER) for PBNI intervention

$$\text{ACER PNBFI intervention} = \frac{Total\ cost\ of\ the\ PBNI\ intervention\ in\ ETB}{Percentage\ points\ change\ in\ HIS\ performance}$$

$$\text{ACER PNBFI intervention} = \frac{813635\ \text{ETB}}{38.8\%}$$

$$\text{ACER PNBFI intervention} = 20{,}970\ \text{per One percent HIS improvement}$$

Average cost-effectiveness ratio (ACER) for the comparator

$$\text{ACER for the comparator} = \frac{\text{The total cost of the PBNI status quo in ETB}}{\text{Percentage points change in HIS performance}}$$

$$\text{ACER for the status quo} = \frac{505{,}160\ \text{ETB}}{9.7\%}$$

$$\text{ACER for the status quo} = 52{,}078\ \text{ETB per one percent HIS improvement}$$

The incremental cost-effectiveness ratio of PBNI intervention

$$ICER = \frac{(Cost\ of\ the\ intervention - cost\ of\ the\ status\ quo)}{(change\ in\ HIS\ perfromance\ of\ the\ intervention\ - change\ in\ HIS\ perfromance\ of\ the\ control)}$$

$$ICER = \frac{813635\ ETB - 505{,}160\ ETB}{38.8\% - 9.7\%}$$

$$ICER = \frac{308475\ ETB}{29.1\%}$$

$$ICER = 10{,}600.5\ ETB\ per\ a\ unit\ percent\ of\ HIS\ improvment$$

The average cost-effectiveness ratio for PBNI intervention was 20,970 ETB per unit percentage improvement in HIS performance, whereas the comparator group had a cost-effectiveness ratio of 52,078 ETB. But the incremental cost-effectiveness ratio for PBNI intervention revealed that 10,600.5 ETB per percentage point of HIS performance can be saved by implementing PBNI with a capacity-building and mentorship program.

Sensitivity Analysis Result

This sensitivity analysis considers the following assumptions:

1. Making the mentorship duration and per diem rate comparable for intervention and comparator groups
2. Changing the training modality from offsite to onsite or at UoG and making the training duration and the per diem rate comparable at the intervention and comparator groups
3. Implement additional intervention packages for the treatment group, like providing educational opportunities to individuals and rewarding smart TVs and computers to facilities.

Based on the assumptions in Table 5, the sensitivity analysis revealed that changes in mentoring, training mode, and per diem fee did not affect the original cost-effectiveness. result. The result was sensitive to mentorship and training modality changes, per diem rates, and intervention packages. The result was least sensitive to the one-way sensitive analysis, with variations in the mentorship duration and per diem rate comparable for the intervention and comparator groups, in which the ICER ranged from 10,600.5 to ICER 11,992. ETB per unit percent of HIS performance. Similarly, the ACER for the comparator group changed from 52,078 to 47,903 ETB, but the ACER for the treatment group had no change.

Table 5: **One-way and three-way sensitivity analysis results for CEA of PBNI intervention at Northwest Ethiopia 2021.**

CEA result before SA					CEA result after one-way SA				CEA result after three-way SA			
	Total cost	Change on HIS	ACER	ICER	Total cost	Change on HIS	ACER	ICER	Total cost	Change on HIS	ACER	ICER
Intervention	813,635	38.80%	20,970	10,600.5	813,635	38.80%	20,970	11,992	1,798,325	38.80%	46,348	39,663.8
Comparator	505,160	9.70%	52,078		464,660	9.70%	47,903		644,110	9.70%	66,403	

In the three-way sensitivity analyses, with the following assumptions,

1. When the training site changed to a commonplace,
2. Having similar mentorship duration and
3. Having similar per diem rates,

Similarly, the ACER for the intervention group changed from 20,970 to 46,348 ETB per unit percent of HIS performance. In contrast, the comparator group

This resulted in an increase in the ICER from 10,600.5 to 39,663.8 ETB per unit percent of HIS performance. changed from 52,078 to 66,403 ETB per unit percent of HIS performance.

Discussion

A PBNI intervention was implemented on a small scale aiming to improve HIS performance. The PBNI intervention was evaluated through a pre-post intervention and comparison group. To quantify the incremental cost-effectiveness of the PBNI scheme relative to the comparator, we developed a decision-analytic model with a performance pathway, cost, and outcomes for HIS performance. The study showed that the PBNI intervention improved HIS performance by 29.1 percentage points and was cost-effective. Even if the program is not similar to this one, the findings support Zambia's study, in which the PBNI intervention was found to be cost-effective (22).

Our analysis discovered that the expenditures of implementing PBNI were significant when compared to non-PBNI comparative districts. The PBNI cost was primarily driven by the payment of incentives and data verification linked to an incentive payment. According to the incremental cost-effectiveness ratio for PBNI intervention, an additional 10,600.5 ETB, or 225.6 USD, is required to improve HIS performance by one percentage point. This means that to increase HIS performance by one percentage point at the district level, we must invest around 225.6 USD. Ethiopia does not have information on the unit increment cost of HIS performance, making comparisons difficult. Still, the implementers can use this finding in the initial phase and consider costs during the program's expansion.

The average cost-effectiveness ratio for PBNI intervention was 446.4 USD per percentage point improvement in HIS performance, of which 1108.6 USD was needed to improve HIS performance at the comparator site The average cost-effectiveness ratio for PBNI intervention was 446.4 USD per percentage point improvement in HIS performance, of which 1108.6 USD were needed to improve HIS performance at the comparator site. This implies that the intervention was more cost-effective than the comparator groups. This is because they're more cost-efficient. After all, the act of recognition itself is the focus, and the value from the healthcare provider's point of view is derived from the act of recognition (23, 24). Non-monetary rewards also have an immediate impact. Rewarding staff and departments with things can take time, meaning losing some of their impacts. Additionally, Non-monetary awards can help in the development of relationships with employees (25).

The ineffectiveness of PBNI to support HIS performance in Ethiopia could be caused by several factors. First, the theory of change that supported the design of PBNI in Ethiopia posited that high levels of non-financial incentives would motivate healthcare workers to improve the HIS implementation and subsequently increase the quality of data and service (26). The availability of resources, such as enough healthcare staff, equipment, necessary drugs and supplies, and efficient referral systems, is crucial to guaranteeing the quality of service providers even though incentives may affect providers (27, 28). However, neither the PBNI program could overcome these systemic resource constraints, nor did the health facilities have the financial autonomy to procure them locally (28).

To conclude, our study found that PBFNI, as implemented in the Wogera district context, was the best use of funds to strengthen HIS performance and was cost-effective. The resources were used with enough flexibility to handle service performance issues even if the amounts allocated were probably too low for several services. Data verification was also cost-effective. During the program's expansion, we considered the cost of data verification and the selection of the performance as important points. Based on the results, it is therefore viable to scale up the intervention. Moreover, further research into the efficiency and cost-effectiveness of PBNI with different designs in large-scale settings is important to ensure its effectiveness and inform how best to strategically purchase health benefits packages in LMICs to make progress toward Universal Health Coverage (UHC).

Strengths and Limitations of the Study

This study assesses the cost-effectiveness of the PBNI intervention using a quasi-experimental study design approach. However, because the trial only lasted six months, it might not accurately reflect how the intervention evolved. Besides, sustainability might be problematic since the intervention packages can be indirectly reflected in incentives. Lastly, the ICER finding could be extrapolated only from similar settings with the HIS performance between 39% and 78%, and this figure might not work for the HIS score beyond these ranges.

Conclusion and Recommendations

A non-financial performance-based incentive motivation strategy in the HIS program implementation enhances the health facilities' performance. A strategy is also a cost-effective approach to enhancing the HIS performance of the health centers. Thus, to increase data quality and evidence-based decision-making with the least amount of resources, it would be desirable to incorporate the performance-based non-financial incentive strategy with the routine HIS program deployment by the health institutions.

Acronym

ACER: Average Cost Effectiveness Ratio, CEA: Cost-Effectiveness Analysis, ETB: Ethiopian Birr, HC: Health Center, HEWs: Health Extension Workers, HIS: Health Information System, HMIS: Health Management Information System, ICER: Incremental Cost Effectiveness Ration, PBNI: Performance-Based Non-financial In-Kind Incentive, HWS: Health Workers, PMT: Performance Monitoring Team, UHC: Universal Health Coverage, UoG: University of Gondar

Declarations

Ethics approval and Consent to participate

Ethical clearance was obtained from the Review Board of the University of Gondar. Oral informed consent was obtained from participants. All data were collected based on codes instead of mentioning the respondents'

names to avoid personal characteristics. The data were secured in the MOH/University repository and prevented any access to the personal identifiers.

Availability of data and materials
Data will be available upon reasonable request from the corresponding author.

Competing interests
All authors declared that they have no conflict of interest

Author Contributions
All authors made significant contributions to the conception and design, acquisition of data, or analysis and interpretation of data; took part in drafting the article or revising it critically for important intellectual content; agreed to submit it to the current journal; gave final approval of the version to be published; and agreed to be accountable for all aspects of the work.

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