

# Implementation Outcomes of Performance Based Non-financial Incentive: using RE-AIM framework

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## Abstract

**Background:** Quality health data production is vital for effective evidence-based decision-making in the health-care industry. Several factors challenge using complete and timely health data in practice. This study evaluated how the Performance-Based None-financial Intervention (PBNI) intervention was reached, effective, adapted, implemented as per the protocol, and able to sustain in the contextual environment using RE-AIM framework.

**Aim:** The study aimed to evaluate the implementation outcomes of PBNI with the coverage (reach), effectiveness, adoption, implementation, and maintenance of the intervention.

**Methods:** The intervention was implemented in Wogera district, northwest Ethiopia. The study used a mixed study design. The quantitative component has a quasi-experimental study design to assess the change in data use due to PBNI. The qualitative component has a phenomenological design to assess the lived experience of participants. The coverage (reach) and effectiveness of PBNI intervention were assessed with descriptive statistics. Key informant interviewees were used to evaluate the adoption, implementation, and maintenance of the PBNI implementation. The coverage and effectiveness of the intervention were assessed using proportions and numbers. Thematic analysis was employed to analyze the qualitative data.

**Results:** A total of 13 participants were involved in the qualitative assessment. Concerning the reach of PBNI, all (six) health centers, all (i.e., 42) departments, and all health workers in the six health centers were covered. Regarding its effectiveness, the data use has resulted in percentage changes of 31% (p-value < 0.001). Concerning the adoption of PBNI, the health management information system focal person confirmed that their health facilities would implement it even after the completion of the project. The implementers were consistently communicating, evaluating performance, and intervening consistently throughout the intervention period, showing the implementation's fidelity. The finding indicated that sustaining PBNI intervention needs strong governmental commitment and active HIS leaders to improve quality health data production and use.

**Conclusion:** The coverage of PBNI, the intervention's effectiveness, and the implementation's adoption were promising. Moreover, there was a conducive environment at the individual, case-team, and facility levels to sustain PBNI. However, long-lasting sustainability would depend on the commitment of the implementer, donor, and government. [*Ethiop. J. Health Dev.* 2023;37 (SI-1)]

## Introduction

Implementation outcomes can be defined as the effects of deliberate or purposive actions to implement new treatments, practices, and services, which could indicate implementation success (1). Empirical evidence proposed that implementation outcomes serve three functions: success, a proximal indicator of the implementation process, and essential intermediate outcomes (2). Outcome measures in implementation science research include implementation, service, and clinical outcomes (1). Out of several frameworks in implementation science research, RE-AIM is a valuable tool for health promotion professionals and practitioners to evaluate programmatic and policy interventions (3). RE-AIM is an acronym for the framework's five evaluation components: Reach (coverage), Effectiveness, Adoption, Implementation, and Maintenance. It is used to assess the impact of intervention at individual and organizational levels (3). Reach dimensions refer to the percentage and characteristics of individuals obtaining the intervention. Effectiveness indicates the impact of the

intervention. Adoption elucidates the percentage and representativeness of the setting that adopts the intervention. Implementation indicates consistency and cost of the intervention, and maintenance shows longer sustainability of the intervention (3).

Pieces of evidence showed that incentivizing the best performers in organizations motivates workers for more remarkable achievement, inspires others for similar accomplishments, and help to establish a good working culture. Empirical evidence in El Salvador and a systematic review on result-based financing in low and middle-income countries elucidated that in-kind incentives improve the performance of individuals and teams in the health-care facility (5,6). Several strategies have been applied to enhance data quality and information use in the Ethiopian health-care system; however, challenges related to data quality and information use persist in the country (7,8). The baseline assessment for this particular study, conducted in the Wogera district, also confirmed that data quality and information use were low: the average level of

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information used for HCs was 33.4%, and the overall average level of accuracy of reports was 0.853 (9). Regarding our knowledge, no empirical evidence was found on the Performance Based Non-Financial Incentive (PBNI) implementation outcome assessment in Ethiopia.

In 2021, implementation research focusing on understanding PBNI affects health data quality and use was conducted in the resource-limited Wogera district, northwest Ethiopia [10-13]. As part of the implementation research, it was essential to measure the implementation success by evaluating PBNI. Therefore, this study aimed to assess the implementation outcome of the PBNI using the RE-AIM framework in Wogera district. Thus, this study can shed light on -similar studies in rural health-care.

## **Methods**

### ***Study design and period***

The study utilized a concurrent mixed study design. The quantitative component used a quasi-experimental study design without a control group by measuring the level of data use and data quality before and after the intervention. The qualitative component, on the other hand, used phenomenological study design to explore the lived experience of individuals regarding the adoption, implementation, and maintenance of the PBNI implementation. Thus, the quantitative component assessed the coverage and effectiveness of the program, whereas the qualitative component explored how the implementation was adopted, implemented, and maintained in the district. The quantitative implementation research was conducted between October 2020 and July 2021 and the qualitative study was conducted in July 2021.

### **Study setting**

The intervention of PBNI was implemented in Wogera district of Amhara region. Its capital is Ambagiorgis, which is located 40 kilometers from Gondar City Administration. According to information from the district health office, the district has 51 Kebeles with a total population of about 278,942. It also shows that one primary hospital, 8 health centers, and 44 health posts provide preventive, promotive, and curative services. There were about 678 health workers and 215 supportive staff in these health facilities. The district covers various ecological areas including 56% cold, 26 % moderate, 4 % forestry, and 13 % hot (14).

### **Participants, sample size and sampling procedure**

The targets of the PBNI intervention were health centers, departments (case-teams), and health workers or individuals. There were 8 HCs in the district. However, two of them in the warfare zone (the war between Tigray People Liberation Front and the Ethiopian government that broke out in November 2021) were excluded from implementing PBNI starting from the initiation of the intervention. Thus, the study which evaluates the implementation outcomes would also exclude these two HCs.

For the quantitative component, information about the number of HCs, active departments, health workers/individuals, data quality and use, etc. were collected from records or by interviewing the heads of HCs or health management information system focal person. Therefore, the quantitative study about the coverage and implementation effectiveness included all the six HCs, all (or 42) departments, and all health workers/individuals (204) working in the six health centers. All the individuals in the six HCs were considered as part of the implementation research because all of them were given the chance to compete for the incentive or reward and would receive recognition based on their performance. Thus, the evaluation of implementation outcomes also considers all the individuals in the six HCs.

To explore the adoption, implementation, and maintenance of PBNI implementation qualitatively, 13 health workers were selected purposively with expert sampling for the in-depth interview, of whom 11 were from health centers and two from district health offices. They had a sort of expertise either in health information technology or a position in the health system so that they would have some knowledge about or the authority to decide on adopting PBNI, its fidelity during implementation, and sustainability.

### **Intervention**

The intervention for this implementation research was an in-kind incentive that was offered based on the performance of the HCs, departments, and health workers — it was a performance-based non-financial incentive (PBNI). Therefore, because of the nature of the intervention (i.e., PBNI), it is required to evaluate performance to identify those who deserve the incentive. Accordingly, because the numbers of HCs and departments are small, their performances were measured only objectively (quantitatively). In other words, their performances were measured with indicators that deal with source document completeness, data accuracy, information displayed, and consistency rate of source document data elements (11).

The same procedure was followed to evaluate the performance of health workers or individuals. However, because health workers are large in number, the evaluation was performed in two phases to ensure the cost-effectiveness of implementation. First, only about 18 health workers were selected from all health facilities who were believed to perform better during the past two months. This is a subjective (qualitative) approach; however, it was carried out with great care by triangulating information about their performance from different evaluators, including the head of the district health office, district health planning office, and the head of the respective HCs. Then, their performances were measured objectively using the same indicators mentioned above. The detail is available in the other paper, which is part of the same project as this paper (11).

### Variables of the study

The reach (coverage) and implementation effectiveness of the PBNI were this study's two most critical quantitative variables. The coverage assesses how much percent of the HCs, departments, and individuals were involved (exposed to) in implementing PBNI. The implementation effectiveness of PBNI considers changes in data quality and information use due to the intervention.

### Operational definitions

**Implementation outcomes:** are the effects of deliberate or purposive actions to implement the intervention (PBNI) and are indicators of implementation success. Thus, we have the following five implementation outcomes according to RE-AIM:

**Reach/coverage:** How much percentage of the health centers, departments, and health workers were involved in the PBNI implementation

**Effectiveness:** The impact of an intervention (PBNI) on data quality and information use

**Adoption:** The use or uptake of an intervention by an organization

**Implementation:** The degree to which facilitators deliver an intervention as it has been initially designed

**Maintenance:** The extent to which an intervention is institutionalized within an organization

**Intervention outcomes:** are the effects of the intervention (PBNI) and are the indicators of an intervention's effectiveness. The two intervention outcomes for the PBNI implementation were data quality and information use. Thus, the levels of data quality and information use were determined based on the following operational definitions (11):

**Data quality:** Data quality was measured with three domains of items, namely timelines of reports on data elements, completeness of data elements, and accuracy of descriptions. Each of these domains has the respective indicators; for instance, for "Completeness" we have a proportion of data elements filled in the source documents and a balance of reportable data elements completely reported, for "Timelines" we have reports sent to health information technologist within 20th to 23rd of the month.

**Information use:** It was measured with five indicators about providing feedback, evidence-based decision making, health coverage calculated, identifying indicators, and target versus achieved estimates. A few of the indicators were "whether performance gaps are identified by comparing achievement against target", "whether root cause analysis is done for low-performing key indicators", and "whether action plan is prepared for the identified priority problems/challenges."

**Reach or coverage:** A health center, department, or individual will be considered as reached or covered by the PBNI intervention if it or s/he is given the chance to compete and requested to be evaluated by the research team expecting a recognition provided by the PBNI platform.

### Data collection procedures

The quantitative and qualitative data used in this study were collected at the end of the six months of the implementation period. A one-day training was given to data collectors and supervisors, and all the field workers were Master's degree holders. The safest places that maintain the privacy of respondents were selected during the data collection to encourage them to give genuine information about their lived experiences with the implementation of PBNI. Tape recorders were used to capture the audio data, and the interviews lasted 33 to 64 minutes.

### Data quality assurance

Various effectors were made to maintain the trustworthiness of the study. To ensure the transferability of the study, there was a tick description about the study settings and participants. In addition to getting the study's dependability, the researchers documented all the procedures followed. The findings and decisions made during the whole implementation period were also registered. We also shared the qualitative data with colleagues to get their feedback and see the confirmability of the analyses and interpretations. To ensure the study's credibility through quality health data, the research team conducted close follow-up and supportive supervision during the whole data collection period. Data collectors with ample experience in qualitative and quantitative data collection were also deployed. Prolonged engagement with the qualitative data and triangulating the qualitative data with the quantitative one was another technique used to maintain the credibility of the data.

### Data processing and analyses

The completed questionnaires were manually reviewed for accuracy. Data were entered into, coded, cleaned with Statistical Package for Social Science (SPSS), and exported to Stata version 14 for further analyses. Descriptive statistics (proportions, number (percent), percentage changes, mean, and standard deviation (SD)) were used to summarize the findings as appropriate. Precisely, proportions, percentages, and numbers were calculated to determine the reach (coverage) of the implementation research for HCs, departments, and individuals. Percentage changes were used to determine the implementation effectiveness or change in data use from baseline to end. The mean and standard deviations were used to describe the characteristics of the study participants.

The qualitative data were transcribed and translated into English and then coded and organized thematically using open-code software. Thus, thematic analysis assessed the qualitative adoption, implementation, and maintenance assessment. The qualitative results were supported with verbatim quotations from interviewees.

### Ethics approval and consent to participate

The Ethical Review Board of the University of Gondar approved to conduct the research. The district health office also offered permission to conduct the implementation research, and each study participant provided their informed consent before the start of the

interview. To avoid revealing personal information, all data were gathered using codes rather than the names of the respondents. The information was kept in the Ethiopian Ministry of Health and the University of Gondar data repository and protected from illegal access.

## Results

### *Background Characteristics of Study Participants*

Six HCs, 42 departments, and all 204 of the health workers employed by the six HCs (42 departments) participated in the quantitative assessment and were therefore included in the study evaluation. A total of 13 participants were included in the qualitative study to explore the adoption, implementation, and maintenance

of the intervention. The minimum and maximum age of interviewees were 26 and 41 years, respectively, with a mean (SD) age of 29 (4.08) years. The interviewees' minimum and maximum work experience were 4 and 20 years, respectively. Participants were interviewed to explore the implementation outcomes, such as adoption, implementation, and maintenance of PBNI intervention. The participants involved in the study were district health office head (n=1), health centers' heads (n=5), HMIS focal persons (n=4), district planning officer (n=1), TB focal person (n=1) and EPI focal person (n=1). The minimum and maximum duration of the interview were 33 minutes and 64 minutes, respectively (Table 1).

**Table 1: Socio-demographic characteristics of interviewees in Wogera district, northwest Ethiopia, 2021**

Participants ID	Sex	Age in years	Educational status	Current position	Work experience in years
P1	Female	30	BSc	TB focal	13
P2	Male	26	BSC	HC head	5
P3	Male	27	Diploma	HMIS officer	6
P4	Female	27	Diploma	EPI focal	6
P5	Male	32	Diploma	HC head	8
P6	Male	41	MPH	WoHO	20
P7	Male	29	BSC	Planning Officer	7
P8	Female	28	Diploma	HMIS officer	6
P9	Male	28	Diploma	HC head	7
P10	Male	33	Diploma	MCH Officer	9
P11	Male	32	BSc	HC head	6
P12	Male	26	Diploma	HMIS officer	4
P13	Male	28	BSc	HC head	7

### **Implementation outcomes**

From the RE-AIM framework, reach, and effectiveness components were used to evaluate the coverage of participants involved and the effect achieved regarding health data quality and information use, respectively. However, adoption, implementation, and maintenance components were used to explore how the intervention was adapted, implemented, and planned to sustain the intervention.

### **Reach**

Performance-based non-financial incentive intervention addressed HCCs, case teams, and health workers in the intervention district. The proportions of individuals, case teams, and facilities involved in PBNI intervention concerning data quality and information use for decision-making were assessed. Accordingly,

the implementation coverage and effectiveness were determined quantitatively. Thus, of the six HCs targeted starting from the implementation of PBNI, all of them (six out of six) were covered during the implementation period. Similarly, all 42 (100%) of the departments and 204 (100%) health-care providers working in the 6 health centers were involved in the implementation research.

A thorough evaluation was applied by triangulating data of participants from the district health offices HCs and assessing awardees' performance from their working units. Individuals, case teams, and facilities were rewarded for their best performances by measuring their performance every two months. In the first round, information was disseminated to all intervention facilities by distributing fliers by a

research team from University of Gondar. Immediately after two months, the effects of PBNI on quality data production and use were assessed by considering the targeted groups for the intervention. The details about quantitative (an objective) performance evaluation techniques are provided in our other research, which is part of a large research project (11).

Accordingly, the two health centers, Ambagiorgis and Birra Health Center were awarded from the six health centers in the intervention district. The maternal and child health case-team from Ambagiorgis HC and the outpatient department case team from Birra HC were awarded. Similarly, two individuals were recognized in the first round for their best performance. In the second round, the intervention was continued by addressing challenges and facilitators identified in the first round. Three health facilities: Ambagiorgis, Bira, and Gedebiye HCs were awarded in the second round for their best achievements. Likewise, three case teams such as the maternal and child health team and medical record units case teams from Dergaj HC, and the maternal and child health case-team from Ambagiorgis health center, were recognized in the second round. Regarding individual awardees, three health workers and three health information technicians were awarded in the second round.

### Effectiveness

The changes in data quality and information use were calculated by comparing the baseline scores with the respective end-line scores after the PBNI intervention.

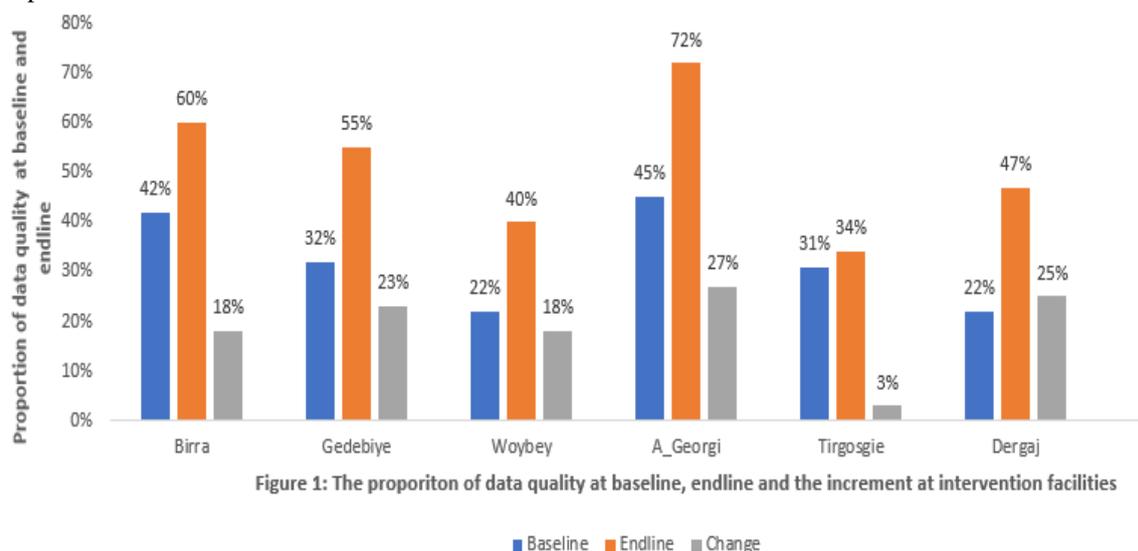


Figure 1: The proportion of data quality at baseline, endline and the increment at intervention facilities

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### Adoption, implementation and maintenance

#### Adoption

The adoption of the implementation research was qualitatively evaluated considering the intervention facility characteristics, the interest of health-care providers, the engagement of the research team from UoG, and the accessibility and security concerns. Recording, archiving, and reporting health data to higher levels on the specified period are some of the

The scores were determined using the respective items to measure data quality and information use as described in the Methods section under Operational Definitions. Thus, concerning the effectiveness of the implementation, the data use was 33.4% at baseline, and has increased to 61.4% after implementing PBNI in Wogera district for six months. Therefore, the data use increased by 28 percentage points (p-value < 0,001). The average baseline data accuracy in the district was 0.853, showing a deviation from the accurate report (i.e. 1.00) by 0.147. However, the average end-line data accuracy was 0.987, which shows a deviation of only 0.013 from the accurate report (i.e. 1.00), showing an improvement in accuracy of 0.1337 (p-value < 0.05).

The proportion of health centers with at least a 10% increment in data quality was reported as there was an effect on the desired intervention outcome. Five out of six health centers had shown greater than a 10% increment in data quality change after the intervention. Improvements in data quality and information use were shown in the intervention district. After the intervention, Ambagiorgis HC scored the highest improvement in data quality (27%) followed by Dergaj (25%), and the slightest improvement was by Tirgosgie (3%). The improvements in data quality for the five health centers were statistically significant (p-value = 0.03), while it was not for Tirgosgie (p-value = 0.17). (Figure 1).

usual tasks of the case teams and individuals in the intervention district.

Among all the intervention participants, health information technicians and officers whose work directly related to health data generation, compiling, and reporting were interested in incentive package

intervention. A female, 27, EPI focal, explained, *“Motivation schemes benefit some health staff, meaning that those individuals working directly with data generation and use might get satisfied more as compared to others.”*

None of the participants claimed that the intervention disrupted the performance instead it was mentioned as a tool to boost the performance of HCs, case teams, and individuals towards sound health data generation and use. A male 26 years health center head explained: *“The award and recognition improve staff and case team performance and encourage others to perform well and be recognized like others.”*

Provision of recognition to individual hard work motivates others to do the same and improve their performance, a male, 28, health center head mentioned: *“It created a good feeling as hard-working individuals thought their efforts were being recognized since not everyone works equally.”*

A leaflet that was produced and sent by the research team to introduce the incentive program had prepared participants for incentive packages in which the participants were told that if they became unable to perform better during the intervention, they would not be able to receive the incentive. As a result, staff motivation has increased, helped the participants be aware of the intervention, and made them psychologically well prepared. A female, 27, EPI focal explained, *“Once an individual has been informed, he/she will further be motivated and work better. He/she will be psychologically satisfied and committed to his job. Moreover, he may motivate others to work in a better way.”* In addition, A Male, 27, HMIS officer, explained: *“Most health professionals and case teams are considering the award since the information is well disseminated to all case teams. We inform them equally, and all have a chance to get the award if they perform well. Nevertheless, what we recommend is based on the practice of case teams and individuals about their data registration, report completeness, timeliness, and data display practices.”*

The two facilities excluded from the intervention (Mareba and Jankil health centers) are inaccessible for transportation and had security concerns, so this intervention package had not involve two facilities, case teams, and health professionals under the two facilities. A male 26 HMIS officer explained, *“The remoteness, security conditions, and difficulty to get transportation to reach Jankil and Mareba health centers were some of the key challenges of this implementation research intervention.”* Therefore, blanket implementation in the future to address transportation and security concerns is recommended.

It is possible to conclude that PBNI was adopted and helped to motivate health professionals concerning data quality and information use in rural Ethiopia. A female, 27 years old, EPI focal, explained, *“We review our activities based on a plan against achievement. Then if there is a low-performing case team, we plan for the next improvement. When we review data quality, we parallelly review the performance.”*

Staff shortage and turnover, priority tasks like community-based health insurance (CBHI) and immunization campaign, COVID pandemic, and the ongoing war in the region were some of the challenges during implementation. The other challenge was accidental programs/duties from political leaders, some health professionals miss their office or case team-based activities as they move to out-reach activities. A female, 27 years, EPI focal *“Our main challenge is a staff shortage, and the patient load is very high, especially after starting CBHI and the staff we have below the standard. In addition, our current condition is another challenge since some of our staff are going to the war front to support the military.”*

As part of the adoption, the UoG team played a critical role. A female, 27 years, EPI focal: *“Previously we negligently omitted different recordings and tally. However, after the support from UoG, we have improved a lot.”* Another male, 27 years old, HMIS officer added: *The system now provides good attention to us and partners, including the University of Gondar, who helps us in different ways.”*

To examine performances, data quality and information use parameters were evaluated bi-monthly before a month to data-day, and the best performers of the past two months were recognized. Health professionals who were selected through the triangulation approach were evaluated based on their data handling and use practice in their respective departments. The implementation was conducted in six consecutive months to evaluate the participants' performances. Health-care professionals were pleased with the incentive mechanism they are told to be awarded if they appear with good quality health data and use. Though incentive mechanisms are promoted to improve health-care data quality and use, they are seldom used to motivate professionals in the health system. Incentive package does not consider particular expertise or the unique character of delivery agents of the incentive package. The accessibility, security concerns, data quality, and information use agenda should be considered in adopting the incentive package.

### **Implementation**

This implementation research faced challenges such as the inability to cover all facilities, case teams, and professionals in the district due to security concerns. The health-care providers may not be equally aware of the intervention, and the ongoing war in the region during the first round of intervention could affect the implementation. However, we created awareness about the evaluation mechanisms using data day in the second and third rounds.

Shortage of health information technology professionals and externalizing activities, i.e., pushing activities to one or two individuals, was one of the challenges. A male, 27 years, HMIS officer: *“Our main challenge is a staff shortage, and the patient load is very high, especially after starting CBHI and the staff we have below the standard. In addition, our current condition is another challenge since some of*

*our staff are going to the war front line to support the military.”*

Though there were observed challenges in the district, there were mechanisms to mitigate the bottlenecks to improve implementation outcomes. A male, 26 years, HMIS officer: *“Awareness creation and forums were created a better chance to discuss and evaluate our performance for better implementation.”*

Since data quality and information use is the cumulative effect of all health staff at health centers, health posts, health posts, and district health offices, PBNI needs modification to include staff at remote health posts and district offices. A Male 32, HC head said: *“The criteria used should be inclusive for all departments. It is better to incorporate the district health office in the reward system.”* Implementing the intervention only at the health center may affect the overall result estimate as a district. A male, 26 years HMIS officer: *“In my opinion, we need to implement the intervention in all parts of the health system from the health post to the district office and provide the incentive to all of them. However, only good performers from health centers were included in this specific intervention.”*

Community-based health insurance was one of the most competitive programs in the intervention district in which participants were given the role in the program as it was one of the politically sound programs.

### **Maintenance**

In the country's health system, there is no separately assigned budget to motivate individuals working in the health system for their best performances. The intervention district has no resources to be utilized in the incentive program. However, participants were motivated and plan to continue the incentive approach by mobilizing resources in the district. A male 26 years health center head explained: *“We will prepare based on the facility context, like thank you sessions, certificates, and posting best performer staff. However, we will communicate with the district health office and integrate it with the actual system as one evaluation mechanism, the district should also use. In addition, screening the best performer by the internal staff may be biased, so we will collaborate with the district health office and manage it after this time.”*

Moreover, the implementing district expected to sustain the incentive package for its health staff. A male 26 years old, health center head said, *“We have discussed and plan to avail budget for a recognition system within our facility, and we will make it formal and communicate with the district health office. For best performers, we plan to give an education chance/scholarship.”* In addition, A female 27 years old, EPI focal person added, *“To sustain at facility level, the support was started a year before with UoG. Hopefully, we can sustain the intervention. Because the linkage between the health center and the health post has already been established.”*

Furthermore, the implementing district wishes to continue the incentive package in the future because they were interested in the changes observed in data quality and information use. A male, 27 years old, HMIS officer, explained: *“When they give good attention to data recording and quality, their service delivery performance for programs is improved. Most case teams whose data management and service delivery were good.”*

From the first, second and third rounds conducted every two months, we conclude that PBNI has a promising effect in data quality and information use practice, as those health-care providers participating in the intervention showed a progressive impact on the selected indicators. A male, 27 years, HMIS officer explained, *“The award and recognition improve staff and case team performance and encourage others to perform well and be recognized like others. The staff who participated in the award show their performance has not declined.”*

To maintain the intervention effect, the health office will not only be stuck waiting for the supporting university for the improved data quality and information use instead, they have the plan to cascade the lessons learned from the implementation periods. A male, 26 years, health center head, *“Our PMT plan to strengthen individual and case team performance via strengthening monitoring and evaluation system, establishing a recognition system is one part of our sustainability plan.”*

In summary, the assessment of implementation outcomes showed promising positive outcomes. The implementation covered all the targeted HCs, departments, and health workers. There was also significant improvement in data quality and use, showing effective implementation. Moreover, the district health offices and the HCs under it showed interest in adopting and sustaining the PBNI implementation following the same procedure.

### **Discussion**

Since implementation research is a relatively new, there is limited evidence of its effectiveness with interventions such as in-kind incentives. Significantly the effects of PBNI on data quality and information use were not well understood in the Ethiopian context. To contribute to the field, this study, which is a part of other considerable research (10-13), examined the implementation outcomes and demonstrated promising changes in the coverage and effectiveness of PBNI. In addition, there was a good result on adopting and implementing the intervention and a conducive environment to sustain it.

The RE-AIM model revealed that the PBNI had impacted the broader population of health-care providers in the implementation area, indicating their motivation for the intervention. All the six HCs that were targeted starting from the initiation of the implementation research were covered by the implementation research. The other two HCs were excluded starting from the beginning of the

implementation due to security concerns or the ongoing war that started after the baseline survey was carried out but before the start of the implementation process (9).

About effectiveness, five out of six of the health centers have scored a change of 15% or more for the level of data quality ( $p$ -value  $< 0,05$  for each HC except Tirgoggie) after the intervention. Similarly, almost all health centers improved information use by 15% or more. The overall data use also increased by 28 % ( $p$ -value - 0.001). It was estimated that all health centers could adopt the PBNI intervention. All these improvements are considered practically significant because each has over 10% change, as suggested by different authors (15,16). However, for health workers who do not think their routine work is directly related to data production and use, the PBNI is not for them, according to their perception. This could be due to the limited awareness and lack of understanding about the significance and unfavorable attitude towards data quality and information use (8).

It was understood that PBNI to improve data quality and information can motivate all health workers in the implementation area. It is not only the material benefit they were awarded that motivated them but also the moral values attached to the official recognition of their performance that led them into the competition pool. However, to get such a boosted interest and healthy competition among health workers, the qualitative study indicated that fair or unbiased evaluation of their performance is mandatory, which otherwise would result in adverse outcomes (8,17). The incentive was also provided to the case teams and health centers too. Therefore, health workers would be collectively initiated to get their case-teams and health centers awarded. This is confirmed with the distribution of awarded individuals, case teams, and health centers: the awarded health centers were those who had either awarded case-teams or individuals, and those awarded case-teams were awarded individuals working in it.

Almost all the health centers have scored more than 15% change in data use, and the changes were statistically significant for each of the health centers except Tirgoggie ( $p$ -value  $< 0.05$ ). The selected data quality indicators also showed improvements across all health centers. All these results showed that the PBNI effectively gets practically significant data quality and information use, as all these changes were more than 10-15% or the minimum threshold suggested by others (15,16). For its successful implementation outcomes, the implementation strategy was adopted by all the higher officials, including the head or administrator of the district(8). The information about PBNI is disseminated across the implementation area or target groups via meetings, leaflets, or telegram.

To enhance the acceptability or adaptation of the PBNI intervention, various efforts were made to minimize the potential bias in selecting awardees by applying objective and subjective approaches constituting

qualitative and quantitative techniques and are detailed in other parts of the study (10-13). Transparency of the methodology used to evaluate can be maintained by discussing the criteria used and how it was conducted in the meetings held the criteria used and conducted in the meetings. Specifically, some health professions are closer to data production and use activities, and others, such as pharmacy, are not. Thus, health information technicians and HMIS officers whose work directly relate to health data generation, compiling, and reporting were interested in incentive package intervention. In addition, information dissemination about the incentive package was conducted by the research team in all the intervention facilities going in person and orienting facility heads and staff. It is an excellent opportunity that, unlike when the understanding of the broader community about the significance of information was low, there is currently better awareness and practice about it because of the information revolution agenda (7).

There are difficulties in implementing PBNI across different case teams and health centers with different infrastructures. However, there must be adaptations or modification techniques to overcome the challenges. Of course, the evaluation team did this by considering a variable called proximity to data production and use by professionals during the evaluation of their performance. However, it is also necessary to maximize the production of data and utilization by every field. It is also good to reward at least a “thank you message” for what they did regarding data use and production to enhance the implementation process. Factors such as trained staff shortage and turnover, other priority tasks like CBHI, immunization campaigns, package, and other pandemics can also be challenges to implementing PBNI.

One of the challenges of the PBNI is its sustainability. No budget can be separately allocated to motivate individuals working in the health system for their best performances. However, the health workers were highly motivated for such a fair evaluation and awarding, which is also evidenced by other authors [18]. Thus, sustaining the whole implementation process requires the government to follow the necessary strategies and provide the resources needed.

#### ***Strengths and Limitations of the study***

The assessment of the performance of HCs, departments, and individual using quantitative and qualitative approaches can be considered a strength of the study. Also, examining implementation outcomes from different directions using the two approaches (qualitative and quantitative) can be seen as another positive essence. However, the failure to include health posts in the implementation research could raise considerable concern about the generalizability of intervention outcomes across the intervention district.

**Conclusion and recommendations.**

The coverage of PBNI was good except for those health centers and health posts excluded by design and security reasons, respectively. The intervention effectiveness and adoption of health workers, case-teams, and health centers were also promising. Moreover, there was a conducive environment at the individual, case-team, and facility levels to sustain PBNI. However, its sustainability depends on the commitment of the implementers and government to maintain the PBNI after the completion of the project period. Therefore, this may imply that scaling up PBNI to improve data quality and information use in similar settings could result in better implementation outcomes.

**Conflict of interest**

The authors declared no financial and non-financial conflict of interest.

**Contributions**

BT, AA, LD, TH, BF conceived and designed the study. AM, MM, MA, TG, contributed significantly to the writing of the manuscript.

**Availability of data and materials**

Data will be available upon the request from the corresponding author

**Consent for publication**

Not applicable

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**Abbreviations**

CBHI: Community Based Health Insurance, EPI: Expanded Program of Immunization, HIT: Health Information System, HMIS: Health Management Information System, PBNI: Performance Based Non-Financial Incentive, PMT: Performance Review Meeting, UoG: University of Gondar

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