Mass Distribution of Insecticide-Treated Nets: A Qualitative Study on Sumba Island

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ABSTRACT

***Background**: The distribution of insecticide-treated nets (ITNs) is one of the main forms of malaria control intervention in Sumba Island. Although it has been running for more than a decade, there are still some gaps in the planning and implementation of this program. **Aims**: This study aims to obtain an overview of the planning and implementation of the mass distribution of ITNs running on Sumba Island, Indonesia. **Methods**: This study is qualitative research conducted in 2019 in all districts on Sumba Island. Data were collected by conducting in-depth interviews with 53 informants, including those in charge of the program, cross-sectors, and communities selected based on the researcher's considerations. Thematic analysis was used to produce the findings. **Results**: The study showed a gap between the number of ITNs and the real target, the sources of data on ITNs targets are different, and cross-sector involvement is limited to socialization activities, not maximizing the socialization and education of ITNs to the community. **Conclusion**: The planning and implementation of the mass distribution of ITNs on Sumba Island have not run optimally at the stages of socialization, logistics management, and distribution to the community. Modification of socialization methods and strengthening of distribution strategies to the community is needed.*

***Keywords**: distribution, insecticide-treated nets, malaria, socialization, Indonesia*

INTRODUCTION

Indonesia is entering a difficult period in the national malaria elimination program. After 10 years of declining cases, the last three years have seen an increase in malaria cases in some areas (Ministry of Health RI, 2018). Indonesia succeeded in reducing the Annual Parasite Incidence (API) to <1% from 2015 to 2020. However, in 2021 the API increased to 1.1% (Ministry of Health RI, 2021). Reducing the number of malaria cases seems easier than working toward sustainable elimination (Dhiman, 2019).

East Nusa Tenggara province has the third highest malaria prevalence rate (1.99%) in Indonesia. Sumba Island is the region with the most cases. Malaria prevalence in West Sumba was 8.61%, in Southwest Sumba 5.20%, in Central Sumba 8.41%, and in East Sumba 7.01% (Ministry of Health RI, 2019). All districts on Sumba Island are in the high endemic category (API 5-50%) and are still in the acceleration stage (Ministry of Health RI, 2018).

Malaria control is part of the Sustainable Development Goals (SDGs) until 2030. The distribution of ITNs is a control effort to reduce malaria cases by protecting part or all of the population at risk. From 2004-2016, 23 million ITNs have been distributed in Indonesia. In 2017, 3,984,224 ITNs were distributed in the Eastern Region and focus areas outside the Eastern Region of Indonesia (DG of Disease Prevention and Control, 2018).

For more than two decades, long-lasting insecticidal nets (LLINs) have significantly reduced malaria morbidity and mortality (Paaijmans and Huijben, 2020). Insecticide-treated nets are more effective in vector control and more cost-effective than Indoor Residual Spraying (IRS) (Zenkov *et al.*, 2017; Setiyaningsih *et al.*, 2018).

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Implementation of the ITNS program needs to pay attention to planning, strategic coordination, cross-sector cooperation, community involvement, and community leaders (Masaninga *et al.*, 2018). Collaborative planning and coordination processes influence the success of the ITN program (Arroz *et al.*, 2018) and coverage can be improved by developing a distribution strategy (Arroz *et al.*, 2017'; Ntuku *et al.*, 2017).

Proper distribution will encourage increased coverage and utilization of ITNs by the community. Several periods of ITN distribution have been carried out but the high malaria cases on Sumba Island is the reason for reviewing the implementation of the ITN distribution program on Sumba Island. This study aimed to obtain an overview of the ITNs program on Sumba Island from planning to distribution to the community including barriers and opportunities in its implementation. The findings will help in planning the ITN program on Sumba Island.

METHODS

This qualitative research has received approval from the Ethics Commission, National Institute of Health Research and Development Ministry of Health of the Republic of Indonesia number LB. 02.01/2/ KE.029/2019. The research was conducted in 2019 in all districts on Sumba Island, namely West Sumba, Southwest Sumba, Central Sumba, and East Sumba.

The research's informants were purposively selected based on specified criteria related to their position as the person in charge of the disease control program, malaria program manager, and other officers who play a role in distributing ITNs to the community. Data were obtained from 53 district informants and collected through in-depth interviews. The informants consisted of community members, cadres, community leaders, the person in charge of the public health center (PHC) program, the person in charge of the health office program, and the vector program section at the central level.

Data were collected by the research team who had been provided with guidelines and materials for ITN programs. The guidelines were based on the guidelines for the mass distribution of ITNs in Eastern Indonesia and were developed during the interview process. The interviews were recorded and transcribed. The results were analyzed based on themes presented in a narrative.

RESULTS AND DISCUSSION

A. General Characteristics of The Informant

Between May - October 2019, we visited and interviewed 53 informants. Informants were selected based on their position and involvement in ITN distribution. We interviewed multiple informants because the ITN program is a multi-role program. Many informants were interviewed to get more information from each role in the implementation of the ITN distribution program on Sumba Island. Public health center (PHC) informants were from PHC with high malaria cases. We visited nine PHCs on Sumba Island, two in West Sumba, three in Southwest Sumba, three in Central Sumba, and one in East Sumba.

A total of 52 informants were from districts on Sumba Island and one informant was a malaria sub-directorate officer from the Ministry of Health who we interviewed while on official duty in East Sumba District. We interviewed a central informant to obtain information and confirmation on the ITN distribution process at the central level. The researcher coded "D" for district health office informants, "Q" for PHC officers, "L" for cross-sector/cadres, "M" for the community, and "PT" for the central informant.

Table 1 shows the general characteristics of the informants. In the years of service characteristic, the missing data are community informants.

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Table 1. Characteristics of District Informants in Sumba Island, 2019

Characteristics	District			
	Southwest Sumba	West Sumba	Central Sumba	East Sumba
Gender				
Male	7	3	5	4
Female	10	7	9	7
Type of Informants				
District Health Officer	4	1	3	3
Public Health Center Officer	8	5	6	4
Cross-Sector and cadres	3	3	3	3
Community	2	1	2	1
Years of service				
0–5 years	7	1	6	3
>5 years	8	8	6	7
Missing	2	1	2	1

B. Overview of Insecticide-Treated Nets Distribution in the Last Period of 2018

Insecticide-treated nets (ITNs) programs in Sumba Island have been running for more than a decade and were the main malaria control intervention most recorded by Sumba Island communities. The last ITNs distribution period was in 2018 a few months before this study was conducted. Initially, ITN distribution was planned for the end of 2017. The ITN distribution schedule in that period shifted because the logistics arrived late in the district. The central informant mentioned:

> *"There were several things that caused it to happen, one: the mosquito nets arrived late...another one is the problem of the distribution cost...so that can make it late." (PT: Vector Control, Sub-Directorate of Malaria)*

The district informant mentioned that the delay was due to transportation problems, namely locations far to reach by land and sea. The delivery of ITNs was through a central contract with a *Franco System* and sent through an expedition. The administrative verification process takes a long time because it requires tiered assessments and checks from the center, province, and district according to the implementation guidelines.

> *"...the schedule was delayed because of transportation issues. Because they have to sign, so they have to sign everything first, verify it, then submit it. It's done, so the financial submission. That process was what made it long." (D1: Head of Disease Control, Central Sumba)*

The whole process was the same in all districts because the logistics were delivered once for Sumba Island. The logistics arrived at the port of East Sumba Regency and then continued by land to Central Sumba, West Sumba, and Southwest Sumba Regencies.

C. General Components of The Insecticide-Treated Nets Implementation Program

The following is an overview and stages of the implementation of ITN distribution on Sumba Island:

1) Planning Coordination: Provincial, District, and PHC levels

Tiered socialization from the provincial, district, sub-district, and PHC levels was conducted more than once and attended by central resource persons, and provincial and district malaria focal points. District ITN needs, budget estimates and community distribution plans were calculated at these meetings. Information on the provincial socialization stage was entirely obtained from the experience of district informants.

The district socialization involved the person in charge of the PHC and cross-sectors such as the subdistrict and village head. The weakness of district socialization was that not all relevant parties knew about and attended the socialization. This condition results in information that is not continuous and uniform. PHC informants in Central Sumba mentioned that they were not aware of the ITNs socialization activities in the district:

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"There was no meeting, the district manager called and said there was a distribution of mosquito nets for the village... so asked for distribution points..." (Q1: PHC Malaria Officer, Central Sumba)

Early notification of ITN distribution allows for better planning for those who should be involved as it fosters a sense of ownership and better orientation toward the program (Masaninga *et al.*, 2018). The involvement of all parties in coordination and planning was to ensure all tiered processes provide a common perspective in understanding the information and rules of ITNs (Arroz *et al.*, 2018). The source of target data needs to be discussed in ITN planning coordination. There were differences in the data sources used in calculating ITN targets in the districts. Informants from Southwest Sumba districts mentioned that, when using village data, there may be data that did not match.

"There were some data that did not match because they use RASKIN data, there were double data..." (Q9: PHC Malaria Officer, Southwest Sumba).

The West Sumba District informant mentioned that data for ITNs were collected directly because a fee was provided for data collection:

"Data collection was done for the distribution of ITNs ...PHC officers and cadres do the data collection because there were transport costs for the data collection." (Q18: PHC Officer, West Sumba)

A study shows that inaccurate targeting data can be caused by unrecorded population mobility, difficult and remote locations, and limited time and transportation costs (Linn *et al.*, 2019). Inaccurate target data can lead to insufficient or even excess ITN logistics. Accurate data sources will help in calculating the population of people who were not protected by new nets and predicting the need for ITNS in the next period.

Targeting and prioritizing ITN intervention can be done using several approaches including statistical and geographical. Whatever approach is used, it must take into account external factors that are significantly associated with malaria incidence such as community characteristics (Young *et al.*, 2022). Appropriate targeting of ITNs is important in achieving ITN coverage indicators because no one can use ITNs if they do not have access to them. Access considerations relate to the costs and health benefits provided (Koenker *et al.*, 2022).

2) Financing

Insecticide-treated nets were distributed to communities free of charge. All financing for this program comes from the central government and Global Fund (GF) grants. Informants from the West Sumba and East Sumba districts stated that the ITN budget was sufficient and funds were prepared for distribution to the house. Research states that in countries that implement this program, 60% of the cost is for the production of ITNs and 40% for operational costs including distribution to the community (Alfonso *et al.*, 2020).

The budget for ITN distribution in 2018 came entirely from the Global Fund. According to informants from the center, there will be a change in the budgeting mechanism for ITN distribution in the future. The budget will be managed directly by local governments through the Specific Allocation Fund (DAK). Local governments are expected to be more focused on implementing the program according to the conditions and needs of each region.

"In the last two years, there has been no ITN procurement from the state budget (APBN) except GF grants. In the future, we will provide a budget through DAK so that direct procurement can be carried out by the regions." (PT: Vector Control, Sub-Directorate of Malaria).

According to the district informant, the malaria control program was greatly assisted by the APBN through DAK.

"It's very helpful that the central and provincial governments pay attention to us. We can't force funds from us... so the budget is very

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helpful." (D11: District Malaria Manager, East Sumba).

In terms of financing, there were not many obstacles that could be explored because all informants mentioned that most of the budget for ITN programs comes from the central government. West Sumba District informants mentioned that the entire budget provided for ITN distribution was sufficient. The budget was provided for distribution starting from the health office until it reached the community.

"All the budget from there... for distribution anywhere has been calculated. The budget for us was sufficient... even to reach remote areas." (D8: Head of Disease Control, West Sumba Sumba).

Budget shortfalls are usually for technical matters related to the personnel involved more than the budget provided during planning. This happened in Southwest Sumba and Central Sumba districts:

"...the manpower in the field was not as planned, for example, we were planned for 1 person but when in the field there were many people involved" (Q8: PHC Malaria Officer, Southwest Sumba)

"For cadres, because at that time sometimes we only asked for two cadres but more came..." (D2: District Malaria Manager, Central Sumba)

Although the cost of bed nets was quite high, malaria prevention through LLINs is seen as more cost-effective than IRS because the additional cost incurred to increase ITN coverage was less than IRS, especially in areas that are not yet resistant to pyrethroid insecticides (Zenkov *et al.*, 2017). The effectiveness of ITN budgets in some countries is influenced by many components. Some of these include the type of ITNs associated with how the ITNs are used, how they are distributed, and the support of the community and society (Paintain *et al.*, 2014).

Malaria cases on Sumba Island are still fluctuating, tending to decrease after the distribution of ITNs and increase afterward. However, the decline in API after the ITN distribution prompted the district to start seeking the continuation of the distribution of mosquito nets from the Regional Budget (APBD) allocation.

"We see that when we get mosquito net assistance our API goes down but when the distribution of ITNs was stuck it goes up. That's why when there are funds, we focus on procuring ITNs," (D10: Head of Disease Control, East Sumba).

If it is deemed effective in controlling malaria, it is necessary to continue the distribution of nets during the next mass distribution period (Koenker, 2018). Expansion of funding sources is important to close the gap of increasing cases with underutilization (Alonso & Noor, 2017).

3) Cross-sector involvement

Cross-sector partnerships are aimed at creating a supportive atmosphere and shaping public opinion for the success of this program. According to the guidelines for the mass distribution of ITNs, the targets of the district partnership are cross-program, cross-sector, NGOs, professional organizations, and other community organizations (DG of Disease Prevention and Control, 2017). There were no NGOs, professional organizations, or other community organizations involved in ITNS distribution in Sumba Island.

"There were no NGO involved..." (Q4: PHC Malaria Officer, Central Sumba)

"So far there were no NGOs involved ... but we usually work with cross-sectors." (Q20: Head of Puskesmas, East Sumba)

The cross-program involved by all district health offices in the distribution of ITNs was only the Maternal and Child Health (MCH) program because there was a special ITN distribution for pregnant women.

"We are integrated with disease control because the program is with them but the target of pregnant

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women is with us." (Q3: Maternal and Child Health Program Manager, Central Sumba)

Cross-sectors that were always involved in the socialization and distribution of ITNs were limited to regional officials such as sub-district and village heads. Village informants stated:

"We were invited...at that time it was not the current sub-district head but the previous one." (L1: Village Secretary, Central Sumba)

"We were invited...they delivered the schedule... During the meeting, we discussed ITNs, how to use ITNs." (L7: Village Head, West Sumba)

The East Sumba district malaria manager mentioned that cross-sectors that play an active role in distributing ITNS were village officials:

"Village officials are involved...the ones who read out the names of the community are the village officials. That's what I found in some places, the village apparatus plays an active role." (D11: District Malaria Manager, East Sumba)

Although several cross-sectors have been involved, not all have played an active role. There were still those who were not present during the distribution and monitoring of mosquito net use in the community. This has led to roles that should have been carried out by cross-sectors being carried out entirely by health workers. Socialization to get cross-sectoral support has not been maximized and has become a ceremonial formality that does not result in cross-sectoral commitment to bed nets.

According to the PHC officer, the involvement of NGOs in the area was more in community empowerment activities, but an NGO engaged in malaria prevention also distributes ITNs, albeit independently:

"...2018, some villages received the distribution of ITNs from Sumba Foundation, not through the PHC, they went directly to the village." (Q1: Head of PHC, West Sumba).

Contributions and commitment from cross-sectors must start with two-way communication with policymakers. Cross-sectors should be involved from the beginning of planning and at the end of program activities, jointly conducting evaluations by listening to inputs and finding solutions to the obstacles found (Vroblevska *et al*., 2022). Good and close collaboration between the health sector and other sectors is important in increasing community acceptance and use of health strategies, including malaria control and other vector-borne diseases (WHO, 2015).

4) Logistics Management

Logistics refers to the supply, storage, and delivery of ITNs. Based on implementation guidelines and planning coordination, the distribution of ITNs is based on sleeping groups. However, some districts did not distribute according to the guidelines. All ITNs are aid that has been allocated and the amount cannot be increased, so it must be adjusted. In that period, 360,100 ITNs were distributed to Sumba Island. East Sumba Regency had as many as 100,000 sheets, Central Sumba 42,700 sheets, West Sumba 67,400 sheets, and Southwest Sumba 150,000 sheets.

Informants from West Sumba and Central Sumba districts mentioned that the number of ITNs received was sufficient. East Sumba district distributed ITNs by taking into account malaria pockets; some areas did not distribute nets. Southwest Sumba district distributed ITNS in all villages without taking into account malaria pocket areas so that ITNs were not distributed based on sleeping groups.

"Less ... the calculation of the need for 265,000, the sleeping groups have been calculated, but the data is from the village. Our allocation is not appropriate." (D6: District Malaria Manager, Southwest Sumba)

A central informant from the malaria sub-directorate mentioned that the lack of ITN supply was due to budget changes. Logistics were originally planned to come from the Global Fund and APBN but the APBN was canceled so all ITN logistics only came from Global Fund assistance.

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The management of ITN storage in the districts is different because not all health centers have warehouses to store nets. This condition causes ITNs to be stored in ways and places that do not meet storage requirements.

> *"Honestly ... at that time we had no storage ... 2018 there were many ITNS, especially because I had 20 villages." (Q12: Head of PHC, Southwest Sumba)*

> *"Emm...I didn't have a warehouse... I was prepared tarpaulins."(Q17: Head of PHC, West Sumba)*

Some PHCs delivered the nets to the distribution points ahead of the distribution schedule but some stored the nets directly at the distribution points.

> *"It was stopped at the PHC, and two days later the distribution started to the villages. Arriving in the village, some were distributed immediately, some tomorrow, but not more than a week, two or three days at most." (Q13: PHC Malaria Officer, Southwest Sumba*)

> *"So when the nets come, we bring them together to the distribution point. It did not stop at the PHC so it was stored at the integrated services post, at the cadre leader's house..." (Q1: PHC Malaria Officer, Central Sumba)*

The ITNs that were directly delivered to the distribution points had to be distributed as soon as possible to the community because the logistics storage requirements were not met. Good logistics management will be more efficient in terms of time, especially in areas with difficult and hard-to-reach areas (Masaninga *et al.*, 2018). Good logistics management is necessary as funding is not the only way to increase coverage. Logistics management has an impact on budget effectiveness and a significant impact on timelines (de Brito *et al.*, 2020).

5) Distribution to the Community

The distribution of ITN on Sumba Island was carried out by gathering the community at the distribution points. Public health centers coordinated through letters and direct meetings with village officials to ensure that information on the distribution of ITNs reached the community. Despite coordinating with village officials, not all communities knew and came at the time of distribution of ITNs so nets had to be delivered to homes, which requires energy and time management.

> *"When the nets were there, they didn't tell us, we only heard from people. So we went to the distribution place..." (M1: Male, Southwest Sumba)*

Non-delivery of information on ITNs distribution may occur due to limited resources and inappropriate methods. The community-based ITNs distribution scheme shows that information about ITNs delivered through mass campaigns and mobile campaigns has encouraged communities to get new or additional ITNs when they need them (Kilian *et al.*, 2020).

> *"...those who happen to be absent, we were going to their houses...tell them how to use it. I went with the officers, not alone." (L8: Health cadre, West Sumba)*

At the time of ITN distribution, not all locations conducted socialization of ITN installation; officers only gave explanations according to the instructions on the ITN packaging. Socialization and education when gathering the community are sometimes ineffective. The community did not come in unison but one by one and even late so some did not participate in the socialization of ITNs installation and maintenance. In addition, people not coming according to the schedule will cause a buildup of targets at certain times. When there is too much crowding, people do not focus on listening and are busy with other activities. The use of language and who provides socialization also affects the attention of the community:

> *"Sometimes not everyone listens to what we tell them. They were busy talking here and there, they didn't hear...it's more appropriate to use the local language, and it has to be certain people, if the health workers…*

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they were busy calming the children, so they didn't hear." (Q16: PHC Malaria Officer, West Sumba)

Another informant mentioned that if they only distribute ITNs then there is no problem but when it comes to socialization, they do not have enough competent personnel. The consistent use of ITNs by the community is not only due to the factor of net ownership but also due to the lack of knowledge and understanding about the use of ITNs and malaria transmission (Astin and Alim, 2020). This is where the role of socialization during the distribution of ITN is important.

"In terms of manpower, the number was sufficient to distribute ITNS, but if the distribution was accompanied by enlightenment to the community, we need more competent personnel." (Q2: Head of PHC, Central Sumba)

Research suggests that the socialization of ITN would be better if delivered directly by experts (Pratamawati *et al.*, 2018). Providing training on ITNs and health for officers and using local languages by officers during socialization can increase the coverage of ITNs (Raghavendra *et al.*, 2017).

When gathering the community, the schedule and location must be emphasized so that there is no accumulation at certain times and points. The distribution point must be large enough and easily accessible to the community. Regulating the flow of community movement including during demonstrations of ITN installation and maintenance is important. In addition to involving hamlet heads and cadres, to mobilize the community to come on time and schedule, announcements can also be made at places of worship or community gatherings such as traditional events (Masaninga *et al.*, 2018).

Another obstacle to the ITN program on Sumba Island was that ITNs were not durable. This was because the habit of the community to care for ITNs is still lacking. The treatment in question includes the habit of washing and sewing the net if there is a tear.

"Use is no problem, but the first maintenance is how to wash, second when the mosquito net was torn...sewing is easy but not done, so it lasts a year." (D1: Head of Disease Control, Central Sumba)

"That's how people were here. A dirty, slightly torn net is immediately turned into a fence to keep out chickens... Even though the ITNs is only one year old." (Q15: Head of PHC, West Sumba)

Many factors cause the lifetime of ITNs to be no more than two years, such as the quality of nets, frequency of washing, length of washing, not sewing torn parts, location of the kitchen, fuel used for cooking, and poor housing construction (Iyer et al., 2019). The use of open flames for indoor lighting and the non-separate location of the kitchen can lead to holes and damage to ITNs (Tomass *et al.*, 2016).

There are still people in Sumba who live or build houses with the construction and layout of traditional houses where the kitchen or fireplace is in the center of the room (Gunawan, Gunawan and Umbu, 2018). Based on observations in several community houses, this condition causes ITNs that were always hanging to become dirty and damaged quickly due to smoke or fire from the wood stoves used. According to the district malaria manager, such conditions cannot be intervened by health workers alone. The use of ITNs needs to be sought so that it is not only effective in the first year of distribution. The sustainability of ITN distribution must be a concern for many parties.

Insecticide-treated nets are a program that continues to be expected by communities in malaria-endemic areas (Astuti *et al.*, 2020). Although there are still obstacles in the implementation of the ITNs program, according to informants, ITNs have reduced malaria cases in several areas on Sumba Island. West Sumba and Central Sumba informants stated that there has been a decrease in malaria cases in recent years since the ITN intervention:

"In the years before the distribution of bed nets, one month almost 300 specifically at the PHC, were positive. But after 2013 there

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was distribution of mosquito nets began to decline, now it's not up to 100 anymore." (Q16: PHC Malaria Officer, West Sumba)

"There was a decrease in cases ... although not drastically, but even if there is an increase, it was no longer as much as in previous years." (Q3: Head of PHC, Central Sumba)

CONCLUSION

The insecticide-treated nets program has been running for more than a decade on Sumba Island, but until the implementation in 2018 there were still several discrepancies with the Implementation Guidelines for Mass ITNs Distribution, including data sources that did not describe the real target, ITNs were not distributed according to sleeping groups and logistics management was not running well, especially in storage.

Cross-sector commitment as a result of socialization does not yet exist. The role of cross-sectors as drivers and shapers of community opinion has not been implemented. Methods of socialization and community education have not been maximized, especially in the installation and maintenance of mosquito nets. However, some districts have made efforts to procure ITNs to increase coverage through local budgets.

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