

The Effectiveness of the KOPI PAHIT Application in Stunting Prevention Efforts in the Porong Community Health Center Work Area

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ABSTRACT

Objective: Stunting is a serious problem in health development in Indonesia because it impacts the quality of future human resources. This study aims to analyze the effectiveness of the KOPI PAHIT (Porong Innovation Complications to Prevent and Overcome Stunting) application as a digital innovation in stunting prevention efforts in the Porong Community Health Center (Puskesmas) work area, Sidoarjo Regency. This application is a digital innovation developed to support monitoring of the nutritional and health status of toddlers, as well as improve education for parents and integrated health post (Posyandu) cadres. **Method:** This study employed a descriptive qualitative method, with data collection techniques including observation, in-depth interviews, and documentation of key health worker informants. Data analysis was conducted using the Miles & Huberman interactive model, which includes word reduction, data presentation, and conclusion drawing. **Results:** The study results show that the KOPI PAHIT application is effective based on Campbell's five effectiveness indicators: program success, target success, program satisfaction, input and output suitability, and achievement of overall objectives. Implementation of this application can significantly reduce the prevalence of stunting from 28% in 2019 to 0.72% in 2025, while simultaneously increasing the ease of early detection, risk factor mapping, and nutrition education for the community. Therefore, challenges faced include limited digital literacy, unequal internet access, and the accuracy of self-measurement by the community. **Novelty:** This research focuses on a comprehensive analysis of the KOPI PAHIT app, a community-based digital innovation at the community health center level, proven effective in stunting prevention. These findings confirm that the use of digital technology can strengthen the national strategy to accelerate stunting reduction and has the potential to be replicated in other regions with similar conditions.

INTRODUCTION

Nutritional problems in early childhood are a serious challenge to public health in Indonesia, both temporary and ongoing. Stunting is a strategic issue and a primary focus of the government in health development. Efforts to improve the nutritional status of the community, including reducing the prevalence of stunted toddlers, are a key goal of national development. Stunting is a growth and development disorder in children caused by long-term malnutrition and repeated infections, characterized by height below the standards set by the Ministry of Health [1]. Stunting occurs when a child is shorter than the average height for their age group, indicating a growth problem in toddlers (infants under five years old). Children who experience stunting generally have weaker immunity to disease. The nutritional status of toddlers is also an important indicator in achieving the Sustainable Development Goals (SDGs), which are monitored through measurements based on age, weight, and height. In stunted toddlers, anthropometric examination results indicate a lower height than toddlers of the same age [2].

Stunting is a condition in which a child experiences growth retardation due to chronic and prolonged lack of nutritional intake and certain infections, especially during the First 1000 Days of Life (HPK), from pregnancy until the child is two years old. This can result in a child's physical growth and development being lower than that of children of the same age [3]. Stunting in toddlers is caused by various factors, including a lack of adequate and balanced nutritional intake from pregnancy through child development, infectious diseases that inhibit the process of nutrient absorption, a mother's lack of knowledge about nutrition and child health, minimal supervision of child growth and development, and poor environmental sanitation and hygiene such as limited access to clean water. In addition, socioeconomic factors such as education level, family income, and social and economic policies in society also have a significant impact on child development. This condition requires serious attention because it can hinder the physical and mental growth of toddlers, reduce intellectual abilities and productivity, increase the risk of degenerative diseases, and increase the risk of illness and death.

Stunting has a significant impact on the growth and development of toddlers, both in the short and long term. Short-term impacts of stunting include impaired brain development, decreased intelligence, impaired physical growth, and impaired metabolism. Meanwhile, long-term negative impacts of stunting include decreased cognitive abilities and learning outcomes, decreased immunity that makes individuals susceptible to disease, an increased risk of chronic diseases as adults, and reduced employment opportunities in the future [4]. Given these various impacts, it is crucial to undertake various preventative measures to address the problem of stunting in toddlers.



Figure 1. Stunting Prevalence Rate in Indonesia

Source: Basic Health Research (2018), Indonesian Toddler Nutritional Status Study (2019), Stunting Rate Prediction (2020), Indonesian Toddler Nutritional Status Survey (2021-2023), processed.

Stunting is a health problem that remains a focus of attention in Indonesia. According to the 2018 Indonesian Basic Health Research (Riskesdas), the prevalence of stunting in Indonesia was 8.7 million or 30.7% of toddlers [5]. Meanwhile, according to available data, the prevalence of stunting in toddlers in Indonesia in 2019 was around

27.7% with a wasting prevalence of 7.4% and underweight of 16.3%, indicating that more than 8 million toddlers experienced stunting [6]. In this case, it can be seen that in 2019, stunting cases in Indonesia decreased by around 3% from the previous year. Furthermore, the prevalence of stunting in Indonesia in 2020 is estimated to decrease by 26.92%, indicating that around 6.3 million toddlers still experience stunting. The decline in stunting rates is predicted to be 0.78% compared to 2019, which amounted to 27.7% experiencing stunting [7].

Based on data from the Indonesian Toddler Nutrition Status Survey (SSGBI) in 2021, the current prevalence of stunting is still at 24.4% or around 5.33 million toddlers experiencing stunting [8]. In this case, it can be seen that in 2021 there was a decrease in the stunting rate of 2.52% from the previous year. Based on data from the Indonesian Nutrition Status Survey (SSGI) released by the Ministry of Health, in 2022, the prevalence of stunting in Indonesia fell to 21.6% or around 4.7 million toddlers who are still at risk of stunting in Indonesia [9]. In this case, the decline in the stunting rate is predicted to be 2.8% compared to 2021, which amounted to 24.4% of toddlers experiencing stunting [10]. Based on data from the Indonesian Health Survey (SKI), the prevalence of stunting in Indonesia in 2023 was recorded at 21.5%, which shows a very small decrease, namely only a decrease of 0.1% from 21.6% in the previous year [11].



Figure 2. Stunting Prevalence Rate in East Java Province
Source: Indonesian Toddler Nutritional Status Survey

This stunting case has occurred in all regions in Indonesia, one of the regions experiencing stunting problems is the East Java Province. The prevalence of stunting in the East Java Province in 2018 was 32.81% of toddlers. Based on data from the Indonesian Toddler Nutrition Status Survey (SSGBI) in 2019, East Java Province had a stunting prevalence of 26.86% of toddlers, while in 2020 there was a decrease in stunting prevalence in the East Java Province area by 25.64% of toddlers, so that it experienced a decrease of 1.22% from the previous year. Then in 2021, East Java Province experienced a decrease in stunting prevalence of 23.50% of toddlers, so that it experienced a decrease of 2.14% from the previous year [12]. In 2022, East Java Province experienced a decrease

in stunting prevalence of 19.20% of toddlers, while in 2023 there was a decrease again by 17.70% of toddlers [13].



Figure 3. Stunting Prevalence Rate in Sidoarjo Regency and Porong District
Source: Basic Health Research (2019), Sidoarjo Regency Communication and Information Service, processed.

One of the areas in East Java Province that experiences stunting problems is Sidoarjo Regency with a prevalence of 26.91% of toddlers experiencing stunting in the Sidoarjo Regency area in 2018. Sidoarjo Regency is a stunting locus district based on the Decree of the Minister of National Development Planning No. Kep.10 / M.PPN / HK / 02/2021 concerning the determination of the expansion of districts / cities as the focus location for integrated stunting reduction interventions in 2022. Based on data from the 2019 Basic Health Research (Riskesdas), the Stunting rate in Sidoarjo reached 23.9% of toddlers experiencing stunting in the Sidoarjo Regency area. One of the areas experiencing stunting problems in Sidoarjo Regency is the Porong District, especially in the working area of the Porong Community Health Center. It was recorded that in the working area of the Porong Community Health Center the Stunting rate in toddlers reached 28% in 2019 [14].

In this case, although data shows that the prevalence of stunting in toddlers has decreased annually, this figure is still far from the target set by the World Health Organization (WHO) which sets a target of 20%. Furthermore, this figure is still far from the target set in the 2020-2024 National Medium-Term Development Plan (RPJMN), which targets a maximum reduction of 14% by the end of 2024. This condition reflects the significant challenges that must still be faced in efforts to overcome stunting in Indonesia. Therefore, in this stunting problem, the Indonesian government has established several policies to prevent and reduce the prevalence of stunting, which is a serious problem in Indonesian public health.

The Indonesian government has established a number of policies to accelerate the reduction of stunting rates, namely Presidential Regulation Number 72 of 2021 concerning the Acceleration of Stunting Reduction which replaces Presidential

Regulation Number 42 of 2013, which serves as the legal basis for the National Strategy for the Acceleration of Stunting Reduction which has been implemented since 2018 by targeting a reduction in stunting prevalence to 14% by 2024 and regulates various aspects such as national strategy, implementation, coordination, monitoring, evaluation, reporting, and funding to accelerate stunting reduction [15]. In addition, the National Population and Family Planning Agency (BKKBN) Regulation Number 12 of 2021 stipulates the National Action Plan for the Acceleration of Reducing Indonesia's Stunting Rates for 2021-2024 (RAN-PASTI) which serves as a guideline for governments at both the central and regional levels in implementing specific and sensitive interventions to reduce stunting rates [16]. The government has also developed a "Roadmap for Accelerating Stunting Prevention in Indonesia 2018-2024" that establishes five main pillars to accelerate stunting prevention, including government commitment and vision, a national-scale campaign, program convergence from the central to regional levels, food and nutrition security, and a monitoring and evaluation system. These policies demonstrate the government's commitment to tackling stunting through a comprehensive, integrated, and high-quality approach, involving coordination, collaboration, and alignment among various stakeholders.

Based on government policy related to accelerating the reduction of stunting rates, which is part of the government's commitment to addressing the problem of stunting in toddlers, the government has taken several strategic steps to prevent stunting, namely by utilizing technology as a tool in implementing these programs. Stunting, a growth problem caused by malnutrition, has become a primary focus because it can affect the quality of future generations. In this effort, the government is not only relying on conventional interventions but also integrating modern technology to increase the effectiveness of stunting prevention programs in various regions in Indonesia. The use of technology in stunting prevention is expected to increase public understanding of the importance of proper nutrition. Through digital platforms and social media, information about stunting and ways to prevent it can be widely disseminated. This can help the public understand the impact of stunting and the importance of providing nutritious food to toddlers.

One of the government's main initiatives is the Supplementary Feeding Program (PMT) based on local food ingredients, which is one strategy for addressing nutritional issues in toddlers. This program was launched by the Ministry of Health to improve the nutritional intake of children, especially those at risk of stunting. By using local food ingredients, the government hopes to provide more accessible and sustainable solutions for communities in various regions, and is expected to encourage sustainable food and nutritional independence for families. This activity also needs to be accompanied by the provision of nutrition and health education to encourage behavioral changes such as support for breastfeeding, education and counseling on supplementary feeding for infants and children (PMBA), hygiene, and environmental sanitation for families [17]. This PMT is also part of 11 intervention programs designed to reduce stunting rates, with a focus on the critical phases of child growth, namely before and after birth.

The development of digital technology has brought significant changes to various aspects of life, including government management. Currently, the application of digital technology requires innovation and development of concepts *e-government*. To prioritize the use of information and communication technology to improve government efficiency, accessibility, transparency, and accountability. In the health sector, there is an innovation where health services for the public are now provided online through *e-health* or electronic-based health services. The public can access these health services anywhere and anytime *real-time*, so that it can facilitate access to health services, and health workers can respond more quickly to public health problems. Therefore, the relationship between digital technology and *e-government* is very important as an effort to transform public services towards more modern and efficient administration, especially in monitoring maternal and child health.

By leveraging digital technology to monitor maternal and toddler health, child growth monitoring can be made more efficient through digital applications and measuring tools. This technology enables parents and health workers to detect the risk of stunting early. With growth monitoring applications, child development can be monitored regularly and accurately, allowing necessary interventions to be implemented more quickly. Furthermore, nutrition applications provide information on children's nutritional needs according to their age and provide access to online consultations with nutritionists. One example of digital technology used to support toddler nutrition education and monitoring is the *Smart Care*. Application *Smart Care* this application was developed to improve the knowledge, attitudes, and skills of integrated health post (Posyandu) cadres and mothers of toddlers. This application simplifies data storage and provides guidance on children's nutritional status. However, using this application requires internet access, which is a challenge in certain areas [18].

In addition, in this technology-based stunting prevention program, the government also utilizes smartphones to disseminate information about stunting prevention to the public, support families, and implement integrated health service posts (Posyandu) for toddlers. Programs such as "Prevent Stunting Ners" use mobile phone applications to support Posyandu activities for toddlers. This approach helps increase public knowledge about stunting, despite obstacles such as limited access to smartphones for some residents in some areas [19]. Technology is used to monitor child growth and development through a digital system that allows for data recording *real-time*. This can help health workers identify stunting risks early and provide timely interventions. Digital data from various sectors is used to strengthen stunting prevention policies. For example, data from social protection programs such as unconditional cash assistance is combined with technology-based health interventions to reach vulnerable groups more effectively [20]. These various government efforts demonstrate that technology plays a crucial role in addressing stunting in Indonesia, although there are still obstacles such as limited digital infrastructure in some regions that the government still needs to address.

In line with the Indonesian government's efforts to reduce stunting rates in various regions, innovative approaches have begun to emerge from various regions across

Indonesia. One innovation that has yielded significant results in reducing stunting rates is found in East Java Province, specifically in Porong District, Sidoarjo Regency. This innovation is called the Compilation of Porong Innovations to Prevent and Overcome Stunting, abbreviated as the KOPI PAHIT Innovation. The KOPI PAHIT Innovation was developed by the Porong Community Health Center as one of the community health center's strategies to prevent and address stunting issues in its work area. Stunting prevention efforts at the Porong Community Health Center have been implemented through various educational programs, child growth and development monitoring, and nutritional interventions for pregnant women and toddlers. However, there are still obstacles in disseminating information and changing community behavior regarding healthy parenting and eating patterns. Therefore, the KOPI PAHIT innovation is expected to improve the delivery of nutrition education and monitoring more effectively and efficiently so that it can be easily accessed by the community.

Based on the results of the interview with Dr. Sapta as the person in charge of the Essential UKM and Public Health nursing, as well as the innovator of the KOPI PAHIT application innovation, the following information was obtained:

"KOPI PAHIT (Compilation of Porong Innovations to Prevent and Overcome Stunting) was born due to the high stunting rate in the Porong Community Health Center area in 2019, which was 28% (Sidoarjo 23.9%). Contributing factors include low knowledge of nutrition, maternal-child health, sanitation, and limited access to services due to the Lapindo mudflow. The COVID-19 pandemic exacerbated the situation as restrictions on face-to-face meetings hampered integrated health posts (Posyandu). The KOPI PAHIT application was developed in 2021 for early detection and mapping of stunting risk factors quickly, in real time, and accurately." (Interview, August 2025).

Based on the results of observations and explanations from the interview results, it can be seen that the innovation of KOPI PAHIT was motivated by the high rate of stunting in the Sidoarjo area reaching 23.9% and the Porong Community Health Center working area reaching 28% in 2019. In addition to the high rate of stunting in the Porong area, the creation of this innovation was also caused by the low level of public nutritional knowledge, low public understanding of stunting, the existence of maternal and child health problems, inadequate sanitation, and limited access to health services due to the Porong area being included in the area affected by the Lapindo Mud. As a result of various factors causing the high rate of stunting in the Porong Community Health Center area, the Porong Community Health Center created an innovation to overcome the problem of stunting in the area, namely the Compilation of Porong Innovations to Prevent and Overcome Stunting innovation which is usually abbreviated as the KOPI PAHIT Innovation.

The KOPI PAHIT innovation emerged in line with the Sidoarjo Regency Government policy as outlined in Sidoarjo Regent Regulation Number 89 of 2021 concerning the acceleration of integrated stunting reduction in Sidoarjo Regency. This policy was motivated by the high stunting rate in the Sidoarjo region, as well as an effort to support the main priorities in the 2020-2024 National Medium-Term Development

Plan (RPJMN). This regulation was strengthened through the Sidoarjo Regent's Statement Letter number 188/197/438.1.1.3/2022-2024, Sidoarjo Regent Regulation Number 90 of 2021 concerning the role of Villages in integrated stunting prevention and reduction efforts in Sidoarjo Regency, and the Decree of the Regional Secretary of Sidoarjo Regency Number 188/12515/438.6.1/2022 concerning regional innovation [14]. Furthermore, this strengthening is also in line with Regent Regulation Number 31 of 2023 in Article 8 which requires each regional apparatus to have at least one regional innovation in accordance with its main duties and functions which are useful for optimizing the performance and public services of the regional government in order to achieve community welfare [21].

The KOPI PAHIT innovation was first implemented by implementing a collaboration between 7 innovations and 6 programs at the Porong Community Health Center in an effort to prevent and overcome stunting problems [22]. The collaboration of the 7 innovations includes the KEMBANG NUSANTARA innovation (Balanced Nutritional Composition of a Healthy Menu for Toddlers to Teenagers), CURHAT BUNDA (Pay Attention to Mothers and Toddlers), PRODUK RECATIN (Porong Cares About the Health of Teenagers and Prospective Brides), GENTONG BESAR (Great Generation of Porong Free of Caries), KUMAN JAHAT (I Care About the Environment by Creating Healthy Toilets), BINTANG BERLIAN (Together with Love, Washing Hands Together with Caring for Health), and PORSI BESAR (Porong Ready to Be Free of Cigarette Smoke) (Porong Community Health Center, August 2025). The innovation involves users of KOPI PAHIT as a supplement for pregnant women and toddlers, and involves various sectors.

In 2020, the Covid-19 pandemic began to hit the world, including Indonesia, causing the government to implement various policies for the public related to health protocols, including avoiding activities that could cause crowds. This situation further worsened the situation in the Porong Community Health Center area due to restrictions on direct interaction, so that Posyandu activities in the area were hampered and the KOPI PAHIT innovation was also impacted. To address this issue, in 2021, the Porong Community Health Center began designing the KOPI PAHIT application as an innovative step to detect stunting early and quickly map stunting risk factors *real-time*, and accurate. This application aims to provide nutrition education, monitor child growth and development, and support communication between health workers, integrated health post (Posyandu) cadres, and parents. Through this digital application, health workers and parents can easily identify the risk of stunting in toddlers, and allows data collection and analysis to be carried out more effectively and efficiently than before. Although the KOPI PAHIT application has been implemented in several villages within the Porong Community Health Center (Puskesmas) working area, cases of stunting in toddlers are still found. Therefore, in-depth research is needed on the effectiveness of this application to assess its contribution to supporting the prevention and reduction of stunting rates directly.

Effectiveness is the relationship between outputs and predetermined objectives. The contribution of outputs to the achievement of objectives is directly proportional to the effectiveness of the organization, meaning that the greater the contribution of outputs to the achievement of objectives, the more effective the organization, program, or activity [23]. John P. Campbell defines effectiveness as the level of success of a program in achieving predetermined objectives. Effectiveness is measured by how far the program is successful in implementing and achieving the desired objectives operationally. According to Campbell J.P., there are 5 most prominent indicators in measuring effectiveness in general: target success, program success, program satisfaction, input and output levels, and achievement of overall objectives [24]. According to Mahmudi (2019:86), effectiveness is the relationship between output and goal achievement. The greater the contribution (contribution) of output, the more effective the organization, program, or activity. Chung & Megginson define effectiveness as the ability of an organization to achieve its objectives and adapt to the environment in order to survive. Ravianto and Wiyono emphasize effectiveness as how well work is carried out according to plan, both in terms of time, cost, and quality. Comprehensively, effectiveness is the ability of an organization or program to carry out its main tasks and achieve its predetermined objectives well.

Several previous studies have described the effectiveness of apps in preventing and addressing stunting. First, a previous study by Marsita, E. & Zakiyya, A. (2024) entitled "The Effectiveness of the Centing Android App in Addressing Stunting Risk Factors in Pregnant Women" found that the Centing app was effective in improving pregnant women's knowledge about stunting. Stunting, weight gain of pregnant women, hemoglobin levels and compliance with Fe tablets. While there is no effectiveness of the CETING application media on the upper arm circumference of pregnant women. This study and previous studies are similar because they both examine the effectiveness of an application to overcome and prevent stunting. However, there is a difference in the focus of the current study with the previous study, namely the difference lies in the application to be studied, because the focus of the current study is the KOPI PAHIT application in the Porong Community Health Center work area and uses a different theory of effectiveness [8].

Second, previous research conducted by Yunita, Anjasmari, & Barkatullah (2025) entitled "Effectiveness of Using the Electronic Ready to Marry Ready to Get Pregnant (ELSIMIL) Application at the Family Planning Extension Center in Pugaan District, Tabalong Regency". The results of this study indicate that although this application has been used as a screening tool and support for family planning programs in Pugaan District, its level of effectiveness is still sufficient and faces various obstacles such as technical problems, inaccurate data, and lack of understanding from users and accompanying officers [25]. This research and previous research are similar because they both examine the effectiveness of an application and the theory of effectiveness used. However, there is a difference in the focus of the current research with previous research, namely the difference lies in the application being studied, because current research focus

on the application of KOPI PAHIT focuses more on preventing stunting through education and monitoring the condition of toddlers, while the Elsimil application is more directed at the screening process for prospective brides and grooms and achieving family planning program targets.

Third, previous research conducted by Leonard, C. R. et al. (2024) entitled "Development of Stunting Care Application for Child Growth Monitoring" explains that the results of the study show that the Stunting Care application is effective in improving independent and practical monitoring of child growth, especially through automatic prediction features and automatic prediction graphs and growth graphs that make it easier for health workers and parents to detect the risk of stunting early, and are able to function offline so they are very helpful in areas with unstable internet connections [26]. This research and previous research are similar because they both examine stunting-related applications for monitoring child growth and development. However, there are differences in the focus of the current research compared to previous research, namely the difference lies in the applications studied, because current research focus on the application of KOPI PAHIT focuses more on increasing public knowledge and awareness through direct educational activities, while the Stunting Care application focuses more on technology and automation of child growth monitoring.

Although the KOPI PAHIT application has been actively implemented in all villages within the Porong Community Health Center (Puskesmas) working area, its effectiveness in increasing community awareness, understanding, and behavioral changes towards stunting prevention still requires further study. This is crucial considering that the program's success depends not only on the availability of technology, but also on the extent to which the technology can be optimally utilized by its users. Therefore, an in-depth scientific study is needed to assess the extent to which the KOPI PAHIT application can achieve its main objective, which is to reduce stunting rates in the region. This study aims to analyze the effectiveness of the KOPI PAHIT application in stunting prevention efforts in the Porong Community Health Center working area using descriptive qualitative research methods, which are expected to provide a comprehensive picture of the application's contribution to stunting reduction programs at the local level, and refers to the effectiveness theory according to John P. Campbell in this study.

RESEARCH METHOD

This study uses a qualitative research method with a descriptive approach that aims to describe and analyze in depth the effectiveness of the KOPI PAHIT application in efforts to prevent stunting in the Porong Community Health Center work area. This descriptive qualitative method was chosen because the focus of the study is to present a systematic, factual, and accurate picture regarding the effectiveness of the KOPI PAHIT application in preventing stunting in the Porong Community Health Center work area. Based on the definition of Bogdan and Taylor, qualitative research methods are used to collect descriptive data both in written and oral form from individuals or observed

behaviors [27]. Moleong (2019) states that descriptive qualitative research focuses on efforts to explore meaning, processes, and social interactions in a particular context so that research results can be presented in the form of systematic and accurate descriptions [28]. The focus of this study is to assess the effectiveness of the KOPI PAHIT application in efforts to prevent stunting in the Porong Community Health Center work area. The selection of research informants was carried out using purposive sampling, namely selecting research subjects who are familiar with and play a direct role in the implementation of the application. The data collection technique was carried out by collecting information from two types of sources, namely primary data and secondary data. Primary data was obtained through in-depth interviews with key informants, namely the person in charge of the Essential UKM and Public Health nursing, as well as the innovator of the KOPI PAHIT application innovation. On the other hand, secondary data was taken from document analysis such as articles, books, archives, and health reports or information regarding child growth and development. The collected data were then analyzed using an interactive model from Miles & Huberman, which includes data reduction, namely the selection and grouping of information, data presentation by comparing field findings to theory, and drawing conclusions [23].

RESULTS AND DISCUSSION

Results

A. Effectiveness of the KOPI PAHIT Application in the Working Area of the Porong Community Health Center, Sidoarjo Regency

The KOPI PAHIT application is a digital innovation developed to support the government's program to reduce stunting rates in the community, particularly in the Porong Community Health Center (Puskesmas) area. KOPI PAHIT stands for Compilation of Porong Innovations to Prevent and Overcome Stunting. This application functions to provide information, nutrition education services, and continuous monitoring of toddler growth and development. This application is designed to be an accessible medium for health workers, Posyandu cadres, and the community, especially mothers of toddlers, to make it easier to obtain information about nutrition education services, maternal health, and early stunting prevention.



Figure 4. KOPI PAHIT Application

Source: Porong Community Health Center, August 2025

The KOPI PAHIT application has several key features designed to assist healthcare workers in recording and monitoring toddler nutrition. The screening feature allows for independent measurement and input of toddler data, such as height, weight, and nutritional status, from the integrated health post (Posyandu) or from home. Parents, healthcare workers, and Posyandu cadres can also input data periodically to determine the nutritional status of toddlers *real-time* by providing information on child growth and development. The questionnaire feature is used to map risk factors for stunting if a toddler is detected with nutritional problems. This allows for more specific and targeted interventions by health workers. The Stunting Education feature provides media articles on stunting such as the definition of stunting, recognizing stunting, detecting stunting, the impact of stunting, and so on, which are useful for pregnant women, breastfeeding mothers, and mothers of toddlers to detect their children early. This feature is useful as an online counseling medium to raise awareness of parents of toddlers about the importance of early stunting prevention. In addition, there is an online Doctor Consultation feature with health workers that is useful for making it easier for parents of toddlers to communicate and consult directly with health center health workers for advice or further information, so that stunting education and treatment can be carried out more effectively and efficiently. The Satisfaction Survey feature serves as a means for application users to assess the services provided through the KOPI PAHIT application. This feature aims to measure public satisfaction with the health services received and assist health centers in evaluating and improving the quality of their services. There are also various other features in the KOPI PAHIT application that can help health workers easily prevent and overcome stunting problems in toddlers.

The KOPI PAHIT application has the advantage of being integrated with health services at community health centers (Puskesmas). Data input by integrated health post (Posyandu) cadres and mothers of toddlers can be directly used for monitoring by health workers. The application also boasts a user-friendly design for both the public and health workers. Health workers and parents can easily use the application to monitor child growth and development and identify stunting risk factors, as well as expand access to health education, particularly regarding stunting. However, its implementation still faces several challenges, particularly limited digital literacy and limited internet access in some areas.

Based on the results of the interview with Dr. Sapta as the person in charge of the Essential UKM and Public Health nursing, as well as the innovator of the KOPI PAHIT application innovation, the following information was obtained:

"To date, 30 community health centers (Puskesmas) in Sidoarjo Regency have studied this innovative idea, and the Health Office has instructed replication. Implementation of the application began at the Porong Community Health Center in 2022, while adaptations at other community health centers will be carried out in stages, adjusting to the readiness of human resources (HR) and other facilities and infrastructure." (Interview, August 2025).

Based on the explanation from the interview results, it can be seen that the implementation of the KOPI PAHIT application at the Porong Community Health Center began in 2022. The implementation of the application in the Porong Community Health Center area was due to the still high stunting rate in the area, low nutritional knowledge and public understanding of stunting, and limited access to health services due to the Porong area being included in the area affected by the Lapindo Mudflow. This problem was exacerbated by the Covid-19 pandemic in 2020 which was caused by restrictions on face-to-face meetings that hampered Posyandu activities, resulting in nutritional education to the community being hampered, recording toddler data being less than optimal, and early detection of stunting risks being hampered. Therefore, to address these problems in 2021, the Porong Community Health Center developed the KOPI PAHIT application as an innovative effort to overcome stunting. This application is designed to facilitate early detection and mapping of stunting risk factors quickly, in *real-time*, and accurately.

In 2022, the KOPI PAHIT application began to be implemented at the Porong Community Health Center. Based on the results of its use, the application was assessed positively in reducing stunting rates. This is because the application can facilitate the process of health workers in monitoring the nutritional status of toddlers, accelerate the reporting of health data, and provide more targeted interventions. The KOPI PAHIT application innovation is not only implemented in the Porong area, but the innovation has also received attention at the Sidoarjo Regency level due to the application's demonstrated effectiveness in reducing stunting rates in the Porong area. To date, as many as 30 Community Health Centers in the Sidoarjo Regency area have studied the innovation concept, and the Sidoarjo Regency Health Office has even instructed the replication of the KOPI PAHIT application in all community health center working areas

in Sidoarjo. However, the application adaptation at each community health center is still being carried out in stages by adjusting to the readiness of Human Resources (HR), as well as the availability of other supporting facilities and infrastructure. This shows that the KOPI PAHIT application has evolved from a local innovation into a program with potential for district implementation.

Based on the explanation of the KOPI PAHIT application as well as the results of research and findings during the field, it can be understood that the KOPI PAHIT application is present as a solution to the stunting problem faced by the people of the Porong area. Therefore, research on the effectiveness of the KOPI PAHIT application in efforts to prevent stunting in the Porong Community Health Center work area needs to be further analyzed to determine the extent to which the application has run according to its intended purpose. To measure the effectiveness of the application, this study uses the theory of effectiveness according to Campbell which has several indicators, namely program success, target success, satisfaction with the program, input and output levels, and achievement of overall goals. Through analysis of these indicators, it can be determined to what extent the KOPI PAHIT application can support stunting prevention and overcome it, the impact on child health in a sustainable manner, and make a real contribution to stunting prevention efforts.

1. Program Success

According to Campbell (1989), program success is measured by the extent to which the program can be implemented according to plan and produce the expected changes. A program can be said to be successful if it can show a significant impact on the problem it is intended to address, and has sustainability in its implementation. This is in line with Steers' (1985) opinion, which states that program success is characterized by the alignment between planning, implementation, and achieved results [29]. In the context of this research on the effectiveness of the KOPI PAHIT application, indicators of program success are seen from its contribution to reducing stunting prevalence, accelerating the nutritional monitoring process, and improving the integration of nutrition services at the integrated health post (posyandu) and community health center (puskesmas) levels.

Based on the results of the interview with Dr. Sapta as the person in charge of the Essential UKM and Public Health nursing, as well as the innovator of the KOPI PAHIT application innovation, the following information was obtained:

"Since the innovation was implemented in 2020 until 2025, the stunting rate in the Porong Community Health Center's work area has successfully decreased significantly, starting from 28% in 2019 to 10.8% in 2020. In 2021, it decreased again to 10% of toddlers. In 2022, it decreased to 3.61% of toddlers. In 2023, it decreased again to 1.6% of toddlers. In 2024, it also decreased again to 0.78% of toddlers, and in 2025, it decreased again to 0.72% of toddlers. This decrease shows that the consistent role of the KOPI PAHIT application facilitates early detection, risk mapping, and rapid intervention so that new cases can be prevented. The KOPI PAHIT application greatly simplifies the process of reporting and monitoring toddler growth and development, because toddler nutritional status data can be immediately known immediately after

input, without waiting for the time-consuming EPPGM process. This application is used in conjunction with integrated health post (Posyandu) activities. Attending toddlers are measured by cadres, while absent toddlers can be entered through home visits or by parents themselves. This data is linked to nutrition interventions at the community health center (Puskesmas). Several challenges exist in implementing this application, including limited smartphone ownership, internet access, digital literacy, and ensuring accurate height measurements by parents or Posyandu cadres. (Interview, August 2025).

Based on the interview results, it can be seen that the implementation of the KOPI PAHIT application since its launch in 2020 until 2025 has shown significant success in supporting stunting prevention efforts in the Porong Community Health Center work area. Data obtained from informants shows that there has been a consistent decrease in stunting prevalence from 2019 before the application was implemented until 2025 when the application has been running until now. The following is data on stunting prevalence in the Porong Community Health Center work area from 2019 to 2025, including the following:



Figure 5. Prevalence of Stunting in the Porong Community Health Center Work Area
Source: Porong Health Center 2025

In 2019, which amounted to 28%, it became 10.8% in 2020, 10% in 2021, 3.61% in 2022, 1.6% in 2023, 0.78% in 2024, and 0.72% in 2025. The significant decline in stunting rates in the Porong Community Health Center work area is a clear evidence that the program has been running according to plan, namely supporting early detection, risk mapping, and rapid intervention so that new cases can be prevented effectively. In addition, the KOPI PAHIT application has been proven to simplify the process of reporting and monitoring toddler growth. Before the application, the reporting process had to go through the EPPGBM system which took a long time, while with this application toddler nutritional data can be known directly (*real time*) after input. This indicates that the program has successfully increased the efficiency of nutritional health services at both the integrated health post (Posyandu) and community health center (Puskesmas) levels. The application is also integrated with Posyandu activities, whereby present toddlers are measured directly by Posyandu cadres, while absent toddlers can

still be monitored through home visits or independent input by parents. Thus, the program not only runs according to plan but is also able to adapt to field needs. However, the application's implementation is not without various obstacles, including limited smartphone ownership, unequal internet access, and limited digital literacy in the community. Another challenge is ensuring the accuracy of height measurements by Posyandu cadres and parents. However, these obstacles do not hinder the overall program's achievement because the Puskesmas continues to provide mentoring and coaching to the cadres and the community.

Based on the research results, it can be concluded that the KOPI PAHIT application has met the program success indicators according to Campbell (1989). This application has proven successful in reducing stunting rates, accelerating the monitoring process, and integrating integrated health post (Posyandu) activities with nutrition services at community health centers (Puskesmas). Although some obstacles remain, the tangible impact on reducing stunting prevalence indicates that this program is effective and can be used as a model for replication in other regions.

This study shows that the implementation of the KOPI PAHIT application contributed significantly to reducing the prevalence of stunting in the Porong Community Health Center working area, from 28% in 2019 to 0.72% in 2025. The findings of this study are in line with the indicators of program success in the theory of effectiveness according to Campbell (1989) which emphasizes the extent to which the program runs according to plan and produces the expected changes. The success of this program is inseparable from the optimization of screening features, risk factor mapping, nutrition education, online consultations, and data integration *real-time* which makes it easier for health workers and the community to detect and intervene early, so that the study is in line with Campbell's theory of effectiveness regarding the success of program implementation. The findings of this study are in line with the results of previous research by Marsita & Zakiyya (2024) regarding the Centing application for pregnant women in the Saigon Health Center work area [8], the results of previous research by Fabialismaya, et al. (2025) who studied the Simpati application (Stunting Handling Information System) in handling stunting in the Sumedang area [30], as well as the results of previous research by Leonard, C. R. et al. (2024) who studied the Stunting Care application in monitoring child growth and development [26], these three studies emphasize the importance of data integration in *real-time* and automatic monitoring functions to accelerate targeted nutritional interventions for toddlers, thus digitizing integrated nutritional monitoring has the potential to increase the effectiveness of stunting prevention programs. The difference in this study lies in the focus of the KOPI PAHIT application, which places greater emphasis on cross-sector collaboration and local adaptation, thus proving more effective in significantly reducing stunting prevalence. Thus, the effectiveness of the KOPI PAHIT application is not only in line with Campbell's theory but also supported by empirical evidence from various previous studies on digital applications in the field of maternal and child health.

2. Target Success

From the perspective of Campbell's (1989) theory of effectiveness, target success can be seen from the extent to which a program is able to reach the target group that has been determined by a program appropriately and provide benefits according to their needs. This indicator assesses whether the program is truly on target, involves key actors, and provides real benefits to the beneficiary group. Thus, if the program's targets can be reached according to plan, then the effectiveness indicator in this aspect can be said to be achieved. In the context of this study, the target success indicator is used to see the extent to which the KOPI PAHIT application can accurately reach its main targets, namely parents of toddlers, Posyandu cadres, and health workers in the Porong Community Health Center working area.

Based on the results of the interview with Dr. Sapta as the person in charge of the Essential UKM and Public Health nursing, as well as the innovator of the KOPI PAHIT application innovation, the following information was obtained:

"The primary target users of the KOPI PAHIT application in the Porong Community Health Center (Puskesmas) are parents of toddlers, integrated health post (Posyandu) cadres, and health workers involved in early detection, education, and stunting intervention. This application provides weight/height measurement features, risk factor questionnaires, education, and online consultations, so that interventions can be more specific, fast, and tailored to the needs of each toddler. The villages covered by the KOPI PAHIT Application program are all villages within the Porong Community Health Center (Puskesmas) working area, including Juwet Kenongo Village, Gedang Village, Porong Village, Pamotan Village, Plumbon Village, Glagaharum Village, and Mindi Village. Most integrated health post (Posyandu) cadres and toddler parents have utilized the KOPI PAHIT application, especially during nutritional status monitoring in February and August. However, daily utilization is still being increased. However, there are still target groups that have not been optimally reached because toddlers in these areas experience limited signal, families without smartphones, or parents with limited digital literacy." (Interview, August 2025)

Based on the interview results, it can be seen that the KOPI PAHIT application in the Porong Community Health Center working area has reached the main target consisting of parents of toddlers, integrated health post (Posyandu) cadres, and health workers involved in early detection, education, and stunting prevention interventions. The use of this application has been comprehensive in all villages within the Porong Community Health Center working area, namely Juwet Kenongo Village, Gedang Village, Porong Village, Pamotan Village, Plumbon Village, Glagaharum Village, and Mindi Village. All of these villages have implemented this application, even all mothers of toddlers who are the main target group have been directed to use the application actively. This information shows that the program coverage has targeted comprehensively throughout the working area, so that the main target group can be reached well. The following is data on villages in the Porong Community Health Center working area that are actively using the application, as follows:

Table 1. Villages Using the KOPI PAHIT Application in the Porong Community Health Center Work Area

No.	Village / Sub-district Name	Number of Toddlers 2025	Already Implementing the KOPI PAHIT Application
1.	Juwet Kenongo Village	248	Already
2.	Gedang Village	313	Already
3.	Porong Village	265	Already
4.	Pamotan Village	272	Already
5.	Plumbon Village	82	Already
6.	Glagaharum Village	405	Already
7.	Mindi Village	85	Already

Source: Porong Health Center, August 2025

However, the level of application utilization among the target population still varies. Most Posyandu (Integrated Service Post) cadres and parents of toddlers have utilized the application, particularly during the toddler nutritional status monitoring period in February and August. However, application use in daily activities is not yet optimal, so active community participation still needs to be increased. Furthermore, some target groups have not been fully reached, such as families without smartphones, areas with limited internet access, and parents with limited digital literacy. This situation indicates that although the target group has been identified and widely reached, successful intensive use still faces several obstacles.

Thus, the findings of this study indicate that the program has met the target success indicators according to Campbell (1989). The KOPI PAHIT application has been fulfilled and shown positive results, because the program has succeeded in reaching all villages within the Porong Community Health Center working area and the majority of parents of toddlers have participated quite well by actively using the application. However, the effectiveness of the target success aspect is not fully optimal considering that there are still community groups who have not received optimal services due to technological constraints and limited digital literacy. Therefore, a strategy is needed to strengthen digital literacy and support network infrastructure so that the target success can be achieved more comprehensively.

This study shows that the KOPI PAHIT application successfully reached its main targets, namely parents of toddlers, integrated health post (Posyandu) cadres, and health workers in all villages within the Porong Community Health Center (Puskesmas) working area. This is in accordance with the target success indicators proposed by Campbell (1989), which explains that the extent to which target success can measure the accuracy of the program's reach with the target group and the benefits for the specified target group. This is also in line with the opinion of Siagian (2001), who stated that program effectiveness can be seen from the extent to which the activities carried out successfully reach and involve the specified target group. The greater the reach of the target group, the higher the level of effectiveness of a program [31]. Based on the findings

of this study, the implementation of the application in all villages covered by the Porong Community Health Center confirms that the program's target has been achieved, although there are still variations in the intensity of application use, especially at the weighing moment. The findings of this study are in line with the results of previous research according to Kasjono & Suryani (2020) regarding the stunting prevention application "Gasing" in high school students in Kalibawang District, Kulon Progo [32], and in line with the results of previous research according to Yulastuti, S. & Diana, H. (2024) who studied the Android-based ASANTI (Anticipation of Stunting in High-Risk Groups) application which provides Stunting Prevention education specifically for pregnant women in high-risk groups in the Mangkubumi Health Center area [33], both studies prove that the application is effective in reaching target users well, resulting in changes in behavior and knowledge related to child nutrition. The suitability of the findings of this study with the situation of the KOPI PAHIT application strengthens the validity that the application has been effective in reaching targets, although several obstacles such as digital literacy, limited internet access, and uneven use of applications were also found in previous studies and this KOPI PAHIT application study, so that these are factors that need to be considered for optimizing program targets. Recommendations from the literature emphasize the need for digital literacy enhancement strategies and infrastructure support to ensure that targets are not only recorded but also actively served.

3. Satisfaction with the Program

According to Campbell (1989), program satisfaction is an indicator of effectiveness that emphasizes the extent to which beneficiaries and implementers feel helped and satisfied with the program's implementation, both in terms of ease of use, accessibility, and benefits obtained. This indicator is important because the level of satisfaction will influence the sustainability of program use and community participation. In the context of this research on the effectiveness of the KOPI PAHIT application, user satisfaction includes the experiences of health workers, integrated health post (Posyandu) cadres, and parents of toddlers regarding the application's ease of use, access to information, and direct benefits in stunting prevention efforts.

Based on the results of the interview with Dr. Sapta as the person in charge of the Essential UKM and Public Health nursing, as well as the innovator of the KOPI PAHIT application innovation, the following information was obtained:

"The KOPI PAHIT application is Android-based and designed to be simple, so its features are easily understood by healthcare workers, integrated health post (Posyandu) cadres, and the public. The application has received a positive response because it facilitates early detection, consultation, and education. The public feels it can more quickly identify their child's condition, allowing them to monitor their child's growth and development in real time. Several suggestions have been received from the public, including requests for the application to be more interactive and usable outside of weighing months, as well as improvements to the display and accessibility." (Interview, August 2025).

Based on the interview results, it was found that the KOPI PAHIT application is easy to understand and use by both health workers, integrated health post (Posyandu) cadres, and the public. The simple Android-based interface makes it easy for users to input and monitor the nutritional status of toddlers. This indicates that the application has successfully adapted to the conditions of users in the field, especially Posyandu cadres and parents of toddlers who have varying levels of digital literacy. Positive responses were shown from both health workers and the public. Health workers felt helped by this application, because it can speed up the process of early detection, consultation, and nutrition education. Meanwhile, the public said they felt helped because they could monitor the growth and development of their children in real time *real-time* without having to wait for the manual recapitulation process, allowing them to take action more quickly if there are indications of nutritional problems. This satisfaction demonstrates the efficiency and ease of access that have made the program well-received by the community. However, there was some feedback from the community, including requests for a more interactive application and for use outside of weighing months, as well as improvements to the appearance and accessibility. This demonstrates user engagement and active involvement in the application's development to better meet user needs. This demonstrates community participation, which is an important indicator of the program's sustainability.

Based on the research results, it can be concluded that the KOPI PAHIT application provides a fairly high level of satisfaction among health workers, integrated health post (Posyandu) cadres, and the community, particularly in terms of ease of use and direct benefits for monitoring child nutrition. Although there are still suggestions for feature improvements, overall, the application has met the program satisfaction indicators in Campbell's (1989) theory of effectiveness. This high level of satisfaction also serves as an important asset for the program's sustainability and replication in other regions.

Based on the research results, users of the KOPI PAHIT application, including health workers, posyandu cadres, and the community, showed a relatively high level of satisfaction with the ease of use and access, the direct benefits of the application in early detection, the consultation feature that helps parents and cadres in monitoring toddler nutrition, and *real-time* nutrition education. According to Campbell, beneficiary satisfaction is an important factor in determining the sustainability of the program. This finding is in line with Campbell's program satisfaction indicators, which show that user satisfaction is an important capital for program sustainability and shows that the program has succeeded in meeting user needs and expectations. The findings of this study are in line with the results of previous research by Yunita, Anjasmari, & Barkatullah (2025) who examined the effectiveness of the Elsimil (Electronic Ready to Marry Ready to Get Pregnant) application in Pugaan District, Tabalog Regency [25], which showed that the level of user satisfaction is influenced by the ease of access to information and the interactivity of the application. The findings of this study are also in line with the results of previous research by Marsita & Zakiyya (2024) regarding the Centing application for pregnant women in the Saigon Community Health Center work

area [8], which also emphasized that increasing community satisfaction can strengthen participation in stunting prevention programs. Based on these two previous studies, it was proven that the relatively high level of user satisfaction resulted from easy access to information and education that was useful to support the sustainability of the program, and could strengthen community participation in the stunting prevention program. Based on this previous study, it is in line with the findings of research on the KOPI PAHIT application which showed high user satisfaction with the ease of use and benefits of the application for users. Thus, the level of user satisfaction with the KOPI PAHIT application confirms that this digital innovation is relevant to community needs. User satisfaction is an important capital for program sustainability and shows that the program has succeeded in meeting user needs and expectations.

4. Input and Output Levels

According to Campbell's (1989) theory of effectiveness, input and output levels are important indicators in assessing a program's effectiveness. These input and output indicators measure the match between the resources used (input) and the results achieved (output). If the results achieved are comparable to or even exceed the resources expended, the program can be considered effective. In the context of this research on the effectiveness of the KOPI PAHIT application, the inputs referred to include funding, human resources (HR), infrastructure, and policy support. Meanwhile, the required outputs include a reduction in stunting prevalence, increased coverage of toddler weighing, and the availability of accurate nutritional data for follow-up interventions.

Based on the results of interviews with health workers from the Porong Community Health Center, namely Mrs. Doctor Sapta as the person in charge of the Essential UKM and Public Health nursing, as well as the Innovator of the KOPI PAHIT application innovation, the following information was obtained:

"Initial funding came from the Regional Public Service Agency (BLUD) (Rp 30 million for application development and Rp 1 million per year for maintenance) and Special Allocation Fund (DAK) for innovation implementation. Since 2024, the application management and development have been taken over by the Sidoarjo Regency Communications and Information Office, so there are no longer any maintenance costs borne by the Porong Community Health Center. The human resources involved continue to include the community health center team, cross-sectoral (village, KUA, Koramil, Polsek, Education Office, and PKK), and the community (religious leaders, community leaders, cadres)." (Interview, August 2025).

Based on the interview results, it was discovered that the implementation of the KOPI PAHIT application was supported by adequate resources, both in terms of funding, Human Resources (HR), and cross-sector support. Initial funding came from the BLUD Porong Health Center amounting to thirty million rupiah for application development and one million rupiah per year for maintenance costs. In addition, there was support from the Special Allocation Fund (DAK) for the implementation of this innovation. Since 2024, the management and development of the application was taken over by the Sidoarjo Regency Communication and Information Service, so that there is no longer a burden of maintenance costs borne by Porong Health Center. From the Human Resources (HR)

aspect, the implementation involved health workers from the health center, cadres of integrated health posts (Posyandu), village governments, KUA (Religious Affairs Office), Koramil (Military Command), Polsek (Sector Police), the Education Office, PKK (Family Welfare Movement), and the community, including religious and community leaders. This involvement between parties demonstrates collaboration in input management that ultimately strengthens the program's output. The results obtained are very comparable to and even exceed the resources used. This is evident in the reduction in stunting prevalence from 28% in 2019 to 1.62% in 2023, as well as the increased coverage of regular toddler weighing. Furthermore, the app generates data on toddler nutrition and risk factors that health workers can use to quickly determine appropriate interventions, resulting in faster and more efficient follow-up.

Based on Campbell's theory of effectiveness on input and output level indicators, it can be concluded that the KOPI PAHIT application has proven effective. In this study, inputs in the form of funds, personnel, and cross-sector support were proven to produce significantly greater outputs, namely a significant decrease in stunting prevalence in the Porong Community Health Center work area, an increase in toddler weighing coverage resulting in more accurate nutritional data, and the availability of data in a comprehensive manner *real time*. This facilitates health workers in implementing targeted interventions. These results demonstrate that the output obtained is comparable to the input used, as with relatively low costs and cross-sector collaboration, significant results were achieved in reducing stunting rates in the Porong Community Health Center's work area. Thus, effectiveness at the input and output levels can be declared achieved, even exceeding the specified targets.

Based on the results of the research analysis, the KOPI PAHIT application shows input and output efficiency where relatively limited initial funding support is able to produce significant output in the form of a decrease in stunting prevalence, an increase in toddler weighing coverage, and the availability of nutritional data *real-time* accurate. This is in accordance with Campbell's (1989) theory of effectiveness on input and output level indicators, which emphasizes that effectiveness can be seen from the match between the input used and the output produced. The findings of this study indicate that the benefit-to-cost ratio is in a good category, mainly due to cross-sector collaboration that is able to strengthen the availability and optimization of resources in program implementation. The findings of this study are also supported by the findings of previous research by Yuliastuti and Diana (2024) on the ASANTI application, which shows that the synergy of inputs in the form of technology and collaboration can produce effective educational and monitoring outputs and contribute to reducing stunting [33]. The findings of this study are also in line with the results of previous research by Fabialismaya et al. (2025) who examined the Simpati application (Stunting Management Information System) in handling stunting in the Sumedang area [30]. Based on the results of the research from the two previous studies, it is confirmed that multi-stakeholder collaboration and service integration can increase effectiveness by maximizing output even with limited input. However, as in previous research, the continuity of funding and

strengthening human resource capacity remain determining factors for long-term success. This proves that the KOPI PAHIT application produces significant output compared to the input used in the form of initial funding, resources and cross-sector collaboration, which indicates that the effectiveness of the application has run optimally in accordance with existing theory and empirical evidence.

5. Achievement of Overall Purpose

According to Campbell (1989), the effectiveness of a program can be seen from the extent to which its stated objectives are achieved comprehensively. Achieving these overall objectives emphasizes the extent to which the program is able to comprehensively realize the main objectives that have been set. If the program's core objectives have been achieved, then the program can be categorized as effective, although several challenges remain in its implementation. In the context of this research, the main objective of the KOPI PAHIT application is to reduce stunting rates in the Porong Community Health Center working area through the use of digital technology in monitoring toddler growth and development, early detection, nutrition education, and health interventions integrated with local and national government policies.

Based on the results of interviews with health workers from the Porong Community Health Center, namely Mrs. Doctor Sapta as the person in charge of the Essential UKM and Public Health nursing, as well as the Innovator of the KOPI PAHIT application innovation, the following information was obtained:

"The KOPI PAHIT application has successfully achieved its goal of reducing stunting rates in the Porong Community Health Center work area, as evidenced by a decline in stunting rates from 28% in 2019 to 1.6% in 2023. This application is aligned with the National Strategy for Accelerating Stunting Reduction, including the mandate of the Regent's Regulation and Decree from Sidoarjo Regency regarding the acceleration of integrated stunting reduction. This application also helps toddlers affected by stunting through screening features and risk questionnaires, stunting toddlers can be identified as early as possible and immediately directed to nutritional, health, and environmental interventions. Challenges faced in achieving the goals of the KOPI PAHIT application include low digital literacy among the community, limited internet access, and ensuring the accuracy of self-measurements. But this application will continue to be developed, both in terms of features and reach, to be more interactive, easily accessible, and replicable in other community health centers, with a broader and more sustainable target of stunting prevention." (Interview, August 2025).

Based on the interview results, it can be seen that the KOPI PAHIT application has proven successful in achieving its main overall goal, namely reducing the prevalence of stunting in the Porong Community Health Center work area. This is evidenced by a significant decrease in stunting prevalence from 28% in 2019 to only 1.62% in 2023. This indicates that the overall goal of the program, namely digital technology-based stunting prevention, has been achieved and even exceeded the target set by the central government, which targets a stunting prevalence of 14% in 2024 [16]. In addition, this application has also helped health workers and Posyandu cadres in early detection of stunting cases through the features screening and risk questionnaires. Toddlers suspected

of stunting can be promptly identified and followed up with nutritional, health, and environmental interventions, thus preventing further worsening of stunting. This application is also aligned with the National Strategy for Accelerating Stunting Reduction, which emphasizes cross-sector integration, data digitization, and early detection and rapid intervention for toddlers at risk of stunting. From a regulatory perspective, the success of the KOPI PAHIT application is also inseparable from the support of local government policies, such as Sidoarjo Regent Regulation Number 89 of 2021 concerning the acceleration of integrated stunting reduction, Regent Regulation Number 90 of 2021 concerning the role of villages, and several decrees from the Regent and Regional Secretary of Sidoarjo that make KOPI PAHIT a regional innovation [14].

Discussion

Although several challenges remain, such as limited digital literacy among the community, unequal internet access, and the accuracy of self-measurement data conducted by families, these do not hinder the achievement of the main objectives of this application. The support from across sectors and the continuous development of the application are actually key factors in its success. These obstacles indicate that the achievement of the overall objective has been successful, but its sustainability still requires strengthening in terms of education, digital infrastructure, and data quality monitoring. The KOPI PAHIT application is also still being developed, both in terms of features and reach so that the application can be more interactive, easily accessible, and can be replicated in other health centers with a broader and sustainable target of stunting prevention.

Based on Campbell's (1989) theory of effectiveness on indicators of overall goal achievement, it can be concluded that the KOPI PAHIT application has successfully achieved its main objective optimally, namely reducing the prevalence of stunting in the Porong Community Health Center work area to below 2%. This success indicates that the program is running effectively and is aligned with national strategies, as well as supported by regional policies. However, for this achievement to be sustainable, it is necessary to strengthen the community's digital literacy aspect, increase internet access, and improve the measurement data verification mechanism. Thus, the indicators for achieving overall goals according to Campbell can be said to have been achieved very well, thus the effectiveness of this application has been running well.

Overall, this study found that the KOPI PAHIT application has succeeded in achieving the program's objectives, namely reducing stunting rates, supporting national policies to accelerate stunting reduction and program integration with regional policies, and improving the quality of digital-based health services. This is in line with Campbell's comprehensive goal achievement indicators, which assess the effectiveness of realizing the program's core objectives. This success is not only reflected in data on decreasing prevalence, but also in the integration of the application with regional policies and improving the quality of digital-based health service governance. This finding is reinforced by the results of previous research on the Android-based Centing application for early detection of stunting in toddlers according to research [34] and the effectiveness

of the Elsimil application in Pugaan District, Tabalog Regency according to [25], which has been proven to show an increase in knowledge and changes in community behavior regarding stunting. Meanwhile, the achievement of the KOPI PAHIT application is able to provide a more tangible impact because it not only increases public awareness of stunting, but also reduces the prevalence of stunting significantly. However, as with other previous research findings and research results related to the effectiveness of the KOPI PAHIT application, it confirms that the continuity of achieving overall objectives still depends on strengthening digital infrastructure, the validity of field data, and the sustainability of funding, so that special attention is needed to maintain the sustainability of long-term program objectives and the success of the KOPI PAHIT application as a digital-based stunting prevention program that can be widely replicated.

CONCLUSION

Fundamental Finding : This study demonstrates the effectiveness of the KOPI PAHIT app in significantly reducing stunting prevalence in the Porong Community Health Center (Puskesmas) work area, highlighting the app's role in early detection and accelerating nutritional interventions. **Implication :** The findings suggest that integrating digital technology into healthcare services can effectively support government efforts to reduce stunting, and the KOPI PAHIT app can serve as a replicable model for other health centers. This also aligns with national development goals, emphasizing the importance of synergy between technology, health policies, and community participation. **Limitation :** However, the study's implementation faced limitations, including challenges with digital literacy, internet access, and potential data inaccuracies, as well as the inability to generalize the findings beyond the specific Puskesmas area. **Future Research :** Future studies should focus on enhancing app features, integrating it with national health systems, improving digital literacy, and exploring the long-term impact of the app on family nutritional behaviors and the sustainability of stunting prevention programs across diverse regions.

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