






# Factors associated with the use of the PUSTAKA online registration service at the Sekaran Community Health Center in Semarang City

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## ABSTRACT

**Background:** Online registration services have been implemented in community health centers to facilitate patient access and reduce long queues by enabling appointment scheduling at specific times. However, the utilization of this service in several community health centers in Semarang City remains below the monthly target of 10%. At Sekaran Community Health Center, for example, the average utilization rate was only 1.03% between June and August 2023.

**Objectives:** This study analyzed the factors associated with the use of the PUSTAKA Online Registration Service at The Sekaran Community Health Center in Semarang City.

**Methods:** This study employed a quantitative research design with a cross-sectional approach. The population consisted of existing patients at Sekaran Community Health Center, with a sample of 97 respondents selected using accidental sampling. The variables examined included age, education, occupation, attitude, knowledge, perceived need, availability of facilities, and ease of obtaining information in relation to the decision to use PUSTAKA services. Data were collected using a closed-ended questionnaire that had previously undergone validity and reliability testing.

**Results:** The results of the research analysis using the chi square statistical test showed the conclusion that there was a significant relationship between the factors of age ( $p = 0.006$ ), education ( $p = 0.007$ ), occupation ( $p = 0.044$ ), attitude ( $p = 0.017$ ), perceived needs ( $p = 0.006$ ), and ease of obtaining information ( $p = 0.021$ ) with the decision to use PUSTAKA services at the Sekaran Health Center.

**Conclusions:** Meanwhile, there is no relationship between knowledge ( $p = 0.812$ ) and the availability of facilities ( $p = 0.114$ ) with the decision to use PUSTAKA.

**Keywords:** community health center, health service utilization, online registration service, patient behavior, PUSTAKA application, Semarang City.

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## INTRODUCTION

The utilization of health services represents an individual's response when experiencing illness or requiring health services. Such utilization encompasses outpatient and inpatient services, visits by healthcare professionals, and other forms of health service utilization (Notoadmodjo, 2010; Thomas, 2020). The utilization of health services can be viewed as a type of individual behavior. This can take various forms, including online registration. The integration of social media into health care communication has been reported to be effective in supporting multidimensional health care services (Farsi, 2021).

Online registration has been implemented in community health centers to make it easier for patients and reduce long queues. One such initiative was introduced by the Government of Semarang City on August 1, 2018, through an innovative program called Puskesmas Tanpa Antrian (PUSTAKA), or Queue-Free Community Health Center (Khoerunnisak, Arso, & Kusumastuti, 2023). In line with the Industrial Revolution 4.0, PUSTAKA aims to reduce the number of patients waiting in line to receive health services at community health centers. This service is available for non-emergency patients and those registered with the community health center as their primary healthcare facility (FKTP). PUSTAKA offers several platforms for online registration, including Short Message Service (SMS), WhatsApp, and the website. Registration can be completed between two days prior to the visit (H-2) and up to 10:00 p.m. on the day before the appointment (H-1). On the day of service, patients present proof of registration and their queue number to the customer service desk or registration counter. Using the PUSTAKA service can reduce patient queues at registration, enabling faster access to care (Rizqulloh, Iqbal, & Puspitasari, 2022). According to research by Yuliani, Arso, & Nandini (2020), the waiting time for patients using PUSTAKA is significantly shorter, with a consistent monthly reduction in registration waiting times.

Based on direct observations, patients using the PUSTAKA service only need to present proof of registration at the counter. In contrast, patients who register on-site must complete several steps, including obtaining a registration number, undergoing a health screening for participants in the National Health Insurance-Indonesia Health Card (JKN-KIS) program, data entry at the registration counter, and waiting to be called at their designated clinic. Although the PUSTAKA service has been available since 2018, its implementation still requires ongoing evaluation. Several community health centers in Semarang City have yet to meet the monthly target utilization rate of 10%. One example is Sekaran Community Health Center, with an average user rate of only 1.03% (June-August 2023). Preliminary studies and field observations, supported by statements from several respondents, indicated that patient congestion at the registration counter occurs at certain times.

Furthermore, interviewed patients reported experiencing lengthy waiting times at the registration counter, which may affect service satisfaction and the overall quality of care provided by the community health center. In fact, the Health Office of Semarang City has conducted both online and offline dissemination, as evidenced by posts on social media. Additionally, stand banners and posters containing information about the PUSTAKA service are displayed in community health centers throughout Semarang City.

Various community characteristics influence the utilization of health services (Herwansyah et al., 2022; Khoerunnisak et al., 2023; Zeng et al., 2020). According

to Andersen's model of health service utilization, the use of health services is determined by three main factors: predisposing factors, enabling factors, and need factors. In addition, [Bastami et al. \(2022\)](#) explained that the utilization of health services is also affected by sociocultural factors, organizational factors, and factors related to both consumers and providers. Preliminary findings indicated that the PUSTAKA service at Sekaran Community Health Center has the lowest utilization rate among the 37 community health centers in Semarang City. This is attributed to community perceptions favoring on-site registration over online registration. Such perceptions are shaped by habitual practices that have been maintained over time, making the adoption of online services slower and more challenging. As an innovation, online registration is not easily embraced by all segments of the population.

Previous qualitative studies reported that the Community Health Center had disseminated information regarding the PUSTAKA service through social media, and most patients were already aware of the system. However, its implementation had not yet been optimal ([Prameswati, Suryoputro, & Fatmasari, 2022](#)). Other studies examining the system through the Technology Acceptance Model (TAM) found that the community generally accepted the online registration system ([Rizqulloh & Iqbal, 2022](#); [Rizqulloh et al., 2022](#)). However, these studies mainly focused on user acceptance rather than the actual utilization of the service. Moreover, demographic characteristics that may influence service utilization were not comprehensively analyzed. Unlike previous studies that mainly examined technology acceptance, this study specifically investigates the factors associated with the actual utilization of the PUSTAKA online registration service by integrating demographic, behavioral, enabling, and need-related factors based on Andersen's utilization framework. Therefore, it is important to identify the factors associated with the decision to utilize the PUSTAKA online registration service at Sekaran Community Health Center. The findings of this study are expected to provide evidence for improving digital health service strategies and increasing the utilization of online registration systems in primary healthcare settings.

## METHODS

### Study Design and Participants

This study employed a quantitative, cross-sectional design. The variables examined included age, education, occupation, attitude, knowledge, perception of needs, availability of facilities, and ease of obtaining information. The dependent variable in this study was the community's decision to use the PUSTAKA service. The study population comprised the average monthly number of outpatients at Sekaran Community Health Center, Semarang City, totaling approximately 3,545 patients. The sample consisted of 97 returning, non-emergency outpatients aged 17-65 years at Sekaran Community Health Center. Participants were selected using an accidental sampling method in accordance with the inclusion criteria. The inclusion criteria were returning outpatients of Sekaran Community Health Center aged 17-65 years who were willing to participate as respondents. Exclusion criteria included patients who discontinued participation during questionnaire completion and those who declined or were unwilling to complete the questionnaire. This study was conducted from August 2023 to January 2024.

## Ethical approval statement

Ethical approval for this study was obtained from the Health Research Ethics Committee of the Faculty of Public Health, Universitas Diponegoro, under certificate number 604/EA/KEPK-FKM/2023. All procedures involving human participants were conducted in accordance with the ethical standards of the institutional research committee and the Declaration of Helsinki. Written informed consent was obtained from all participants before participation, and the confidentiality of participant information was strictly protected throughout the research process.

## Research Instruments

Data were collected using a closed-ended questionnaire, encompassing all study variables, which had previously passed validity and reliability testing. The Pearson Correlation coefficient/ $r_{\text{count}}$  were higher than critical values/ $r_{\text{table}}$  (0.279) and the Cronbach alpha score  $> 0.6$  which means all the variables are valid and reliable. The questionnaire consists of questions about the respondents' characteristics (sex, age, educational level, and occupational background), and attitude, knowledge, perception of needs, availability of facilities, and ease of obtaining information as the independent variables and the decision to use PUSTAKA as the dependent variable. The questions developed based on the Andersen's model of health service utilization.

## Data Analysis

Data analysis included univariate analysis to describe the frequency distributions of all variables and bivariate analysis to examine relationships between independent and dependent variables. Statistical analysis was performed using the chi-squared test with a significance level ( $\alpha$ ) of 5%.

## RESULTS

Based on [Table 1](#), the majority of respondents were female (53.6%). The age distribution was relatively even, indicating no specific age-related trend in PUSTAKA service utilization. Regarding educational attainment, most respondents had a high level of education (75.3%). Furthermore, a greater proportion of respondents were employed (56.7%) than were unemployed (43.3%).

**Table 1.** Characteristics of Respondents

Characteristic	Frequency	Percentage (%)
<b>Sex</b>		
Male	45	46.4
Female	52	53.6
<b>Age</b>		
Late adolescents	34	35.1
Adults	39	40.2
Elderly	24	24.7
<b>Education Level</b>		
Low ( $\leq$ junior high school)	24	24.7
High ( $>$ junior high school)	73	75.3
<b>Occupation</b>		
Unemployed	42	43.3
Employed	55	56.7

**Table 2.** Frequency Distribution of Research Variables

Category	Frequency	Percentage (%)
<b>Attitude</b>		
Less supportive	31	32
Supportive	66	68
<b>Knowledge</b>		
Low	39	40.2
High	58	59.8
<b>Perception of Needs</b>		
Less good	40	41.2
Good	57	58.8
<b>Availability of Facilities</b>		
Inadequate	45	46.4
Adequate	52	53.6
<b>Ease of Obtaining Information</b>		
Difficult	43	44.3
Easy	54	55.7
<b>Decision to Use PUSTAKA</b>		
Less willing	31	32
Willing	66	68

**Table 3.** Cross-Tabulation of Research Variables

Variable	Decision to Use PUSTAKA				Total		<i>p</i>
	Less willing		Willing		f	%	
	f	%	f	%			
<b>Age</b>							
Late adolescents (17-25)	5	14.7	29	85.3	34	100	0.006*
Adults (26-45)	13	33.3	26	66.7	39	100	
Elderly (46-65)	13	54.2	11	45.8	24	100	
<b>Educational Attainment</b>							
Low	13	54.2	11	45.8	24	100	0.007*
High	18	24.7	55	75.3	72	100	
<b>Occupation</b>							
Unemployed	18	42.9	24	57.1	42	100	0.044*
Employed	13	23.6	42	76.4	55	100	
<b>Attitude</b>							
Less supportive	15	48.4	16	51.6	31	100	0.017*
Supportive	16	24.2	50	75.8	66	100	
<b>Knowledge</b>							
Low	13	33.3	26	66.7	39	100	0.812
High	18	31.1	40	68.9	58	100	
<b>Perception of Needs</b>							
Less good	19	47.5	21	52.5	40	100	0.006*
Good	12	21.1	45	78.9	57	100	
<b>Availability of Facilities</b>							
Inadequate	18	40	27	60	45	100	0.114
Adequate	13	25	39	75	52	100	
<b>Ease of Obtaining Information</b>							
Difficult	19	44.2	24	55.8	43	100	0.021*
Easy	12	22.2	42	77.8	54	100	

The frequency distribution of the research variables was divided into two categories for each variable. This categorization was based on the median score for each variable, calculated from its total score. According to the [Table 2](#), 66

respondents (68%) supported the use of the PUSTAKA service, indicating a positive response from patients at Sekaran Community Health Center. Additionally, most respondents demonstrated a high level of knowledge. Regarding perceptions of need, 57 respondents (58.8%) reported the need for the PUSTAKA service because it is faster and eliminates the need to queue. Regarding the availability of facilities, 52 respondents (53.6%) considered the PUSTAKA-related facilities at Sekaran Community Health Center to be adequate, with banners and posters present within the center. Finally, 54 respondents (55.7%) stated that they found it easy to obtain information about PUSTAKA, which they accessed through healthcare professionals, family members, friends, and the internet.

Table 3 shows that age, educational attainment, occupation, attitude, perceived needs, and ease of obtaining information were significantly associated with the decision to use the PUSTAKA online registration service ( $p < 0.05$ ). Younger respondents with higher educational attainment, employment, supportive attitudes, perceived greater needs, and easier access to information were more likely to use the PUSTAKA service. In contrast, knowledge ( $p = 0.812$ ) and the availability of facilities ( $p = 0.114$ ) were not significantly associated with service utilization.

The findings indicated that 66 out of 97 respondents (68%) were willing to use the PUSTAKA service. This shows a positive response from respondents, suggesting that the practicality, convenience, and necessity offered by PUSTAKA influenced their decision to utilize the service.

## DISCUSSION

This study found a significant relationship between age and the decision to use the PUSTAKA service ( $p = 0.006$ ), indicating that late adolescents and adults were more likely to use the online registration system than elderly respondents. The highest willingness to use PUSTAKA was observed among late adolescents (85.3%), whereas elderly respondents showed the lowest (45.8%). Field observations suggested that younger respondents were more familiar with technology and adapted more easily to digital innovations. These findings are consistent with [Notoadmodjo \(2010\)](#), who stated that age influences health service utilization by affecting perceptions and acceptance of information technology. Members of Generation Z are generally more accustomed to using technology in their daily activities and tend to adapt more quickly to technological developments ([Hastini, Fahmi, & Lukito, 2020](#)). Previous studies also identified older age as a barrier to the utilization of health technologies ([Bertolazzi, Quaglia, & Bongelli, 2024](#)). Similarly, [Badr, Motulsky, & Denis \(2024\)](#) reported that younger individuals are more likely to use digital health technologies, whereas older adults are often less familiar with digital applications and technological advancements.

The findings of this study are generally consistent with previous research on the PUSTAKA service, which demonstrated that facilitating conditions, hedonic motivation, price value, and habitual behavior significantly influenced public interest in utilizing digital health services ([Khoerunnisak et al., 2023](#)). The present study further expands these findings by showing that demographic and behavioral factors, including age, educational attainment, occupation, attitude, perceived need, and ease of obtaining information, also play important roles in influencing the decision to use PUSTAKA. Both studies indicate that the utilization of digital healthcare services is not solely determined by knowledge or technology availability, but also by perceived

usefulness, behavioral readiness, accessibility, and user acceptance toward digital health innovations.

This study also identified a significant relationship between educational attainment and the decision to use the PUSTAKA service ( $p = 0.007$ ), indicating that respondents with higher levels of education were more likely to use the online registration system. Respondents with higher educational attainment demonstrated better ability to absorb and understand health-related information, including digital health services. However, some respondents with good knowledge still chose not to use the service, suggesting that knowledge alone does not always lead to behavioral change (Humairah, 2020). These findings support the notion that higher educational attainment contributes to more rational decision-making regarding health service utilization. Consistent with previous studies, education was found to significantly influence healthcare utilization among young females in low- and lower-middle-income countries, indicating that educational exposure may improve individuals' awareness, understanding, and responsiveness toward healthcare needs (Nishan et al., 2025). Previous studies also reported that individuals with lower educational attainment tend to exhibit more negative attitudes toward healthcare technology use than those with higher levels of education (Lee et al., 2022). A systematic literature review further confirmed that higher educational attainment consistently supports the use of healthcare technology, whereas lower educational attainment may limit technology adoption (Bertolazzi et al., 2024). In addition, individuals with higher education are more likely to have access to digital devices, internet services, and health applications (Badr et al., 2024).

Occupation was significantly associated with the utilization of the PUSTAKA service ( $p = 0.044$ ), with employed respondents demonstrating a higher willingness to use the service than unemployed respondents. This finding suggests that employed individuals tend to prefer efficient healthcare services that minimize waiting time and reduce disruptions to work schedules. In this study, respondents considered PUSTAKA beneficial because they only needed to present proof of registration upon arrival at the community health center. Time efficiency and flexible scheduling are important advantages for working individuals who must balance healthcare needs with occupational responsibilities (Laker, Fontinha, & Walker, 2024). Previous studies similarly reported that employees with limited work flexibility and restricted access to paid leave benefits substantially benefit from health technology use, as it saves time accessing healthcare services (Hegland & Berdahl, 2022). Mohammadzadeh et al. (2023) also stated that digital health services improve time efficiency, reduce waiting times, and enhance overall healthcare experiences.

This study demonstrated a significant relationship between attitude and the decision to use the PUSTAKA service ( $p = 0.017$ ), suggesting that respondents with supportive attitudes were more likely to utilize the online registration system. Most respondents perceived that PUSTAKA saved registration time and simplified access to healthcare services, reflecting positive attitudes toward efficiency and convenience. Positive attitudes toward digital healthcare also indicate openness to technological innovation and modern healthcare delivery systems. These findings align with Notoadmodjo's (2010) assertion that attitude reflects an individual's readiness to act. Several advantages of PUSTAKA identified in this study included ease of access, improved service efficiency, and convenience for employed respondents because the service can be accessed remotely. Previous studies applying the extended Technology Acceptance Model (TAM) also demonstrated that positive

attitudes, perceived usefulness, and self-efficacy significantly influence the intention to use digital health applications (Mouloudj et al., 2023). Similarly, Rizqulloh & Iqbal (2022) reported that positive attitudes and perceptions increase the likelihood of optimal utilization of health services.

In contrast, this study found no significant relationship between knowledge and the decision to use the PUSTAKA service ( $p = 0.812$ ). Although most respondents had good knowledge regarding PUSTAKA, this did not necessarily encourage them to use the service. Several respondents answered questions about registration procedures and schedules incorrectly, indicating gaps in their practical understanding of the system. These findings suggest that knowledge alone is insufficient to influence behavior without support from other internal and external factors. Green & Kreuter (2005) explained that knowledge may facilitate behavior but does not automatically become the basis for action. Other supporting factors, such as attitude, educational attainment, facility availability, and ease of obtaining information, may play more important roles in encouraging digital health service utilization.

Perceived need was significantly associated with the decision to use the PUSTAKA service ( $p = 0.006$ ), indicating that respondents who perceived greater benefits and necessity were more likely to utilize the service. Most respondents considered PUSTAKA useful because it simplified the registration process and reduced waiting time at the community health center. The availability of multiple access platforms also increased the service's perceived convenience. These findings support previous research showing that patient satisfaction and healthcare utilization are strongly influenced by waiting experiences and service efficiency (Juliá Nehme, et al., 2021). Other studies also reported that digital healthcare utilization is motivated by the need for efficient access to healthcare and shorter waiting times (Mohammadzadeh et al., 2023). Furthermore, integrating digital technology into healthcare systems improves patient flow and efficiency in service utilization (Tlapa et al., 2022). Therefore, positive perceptions of accessibility, convenience, and efficiency appear to strengthen the perceived need to use digital healthcare services such as PUSTAKA.

This study found no significant relationship between the availability of facilities and the decision to use the PUSTAKA service ( $p = 0.114$ ). Although most respondents considered the facilities adequate, field observations revealed that many respondents were unaware of informational banners and promotional materials related to PUSTAKA displayed at the community health center. Several respondents admitted that they focused more on the clinic queue display and waiting process than on observing the surrounding information media. These findings indicate that the availability of facilities alone may not be sufficient to encourage service utilization. Other factors, including attitude, knowledge, and individual behavioral readiness, may play more substantial roles in influencing the utilization of digital healthcare services.

Ease of obtaining information was significantly associated with the decision to use the PUSTAKA service ( $p = 0.021$ ), suggesting that respondents with better access to information were more likely to use the online registration system. Respondents stated that information regarding PUSTAKA was generally easy to understand and that healthcare staff or customer service personnel could be contacted for clarification. The availability of accessible and well-organized information may facilitate healthcare technology adoption and improve patient engagement. These findings are supported by previous studies showing that clear presentation of

information is an important facilitator of digital health utilization (Bertolazzi et al., 2024). Zhang, Bullen, & Chen (2025) also reported that information accessibility through digital platforms significantly enhances healthcare engagement and utilization. However, several respondents stated they had never received information about PUSTAKA from healthcare professionals or community members, suggesting that dissemination efforts may still be limited. Inadequate digital literacy and insufficient promotion may therefore reduce the use of digital healthcare services despite the availability of the technology.

The mechanism underlying these findings may be explained through the interaction between digital literacy, perceived usefulness, behavioral readiness, and access to health-related information. Younger respondents, individuals with higher educational attainment, employed participants, and respondents with supportive attitudes were more likely to utilize the PUSTAKA service because these groups generally possess better digital adaptability, greater exposure to technology, and stronger motivation to seek efficient healthcare services. Educational attainment may improve cognitive ability in processing health information and evaluating the benefits of digital health systems. At the same time, employment status may increase the need for time-efficient healthcare access due to occupational demands. In addition, positive attitudes and a higher perceived need may strengthen individual acceptance of digital innovation by increasing perceived usefulness and convenience, key determinants of health technology adoption. Conversely, knowledge alone may not directly translate into behavior, as technology use is also influenced by enabling and reinforcing factors, including information accessibility, behavioral readiness, digital confidence, and environmental support. This explanation is consistent with the Technology Acceptance Model (TAM), which states that perceived usefulness and perceived ease of use strongly influence behavioral intention toward technology adoption, as well as Green's behavioral theory emphasizing that knowledge alone is insufficient to generate behavioral change without supporting and reinforcing factors (Mouloudj et al., 2023; Green & Kreuter, 2005). Furthermore, previous studies have demonstrated that digital literacy, information accessibility, and positive perceptions of healthcare technology substantially contribute to the utilization of digital health services (Bertolazzi et al., 2024; Badr et al., 2024).

The findings of this study have important implications for the development and implementation of digital health services, particularly in primary healthcare settings. Since age, educational attainment, occupation, attitude, perceived need, and ease of obtaining information significantly influenced the utilization of the PUSTAKA service, healthcare providers and policymakers should prioritize strategies that improve digital literacy, strengthen public awareness, and enhance user engagement with digital health platforms. Educational and promotional interventions should be tailored to older adults and individuals with lower levels of education who may face greater barriers to technology adoption. In addition, improving the accessibility, clarity, and dissemination of information regarding digital health services may increase public acceptance and utilization. The findings also suggest that digital health systems should be designed to emphasize convenience, efficiency, and user-friendly interfaces to strengthen positive perceptions and perceived usefulness among users. Ultimately, optimizing these factors may contribute to more equitable access to healthcare services, reduced waiting times, and improved efficiency of healthcare delivery in community health centers.

## Limitations of the study

This study has several limitations that should be considered when interpreting the findings. First, the cross-sectional design only captured respondents' conditions and perceptions at a single point in time, limiting the ability to determine causal relationships between variables. Second, the use of accidental sampling may limit the generalizability of the findings to the broader community health center user population. Third, the study relied on self-reported questionnaire data, which may be subject to recall bias and social desirability bias. In addition, this study was conducted at only one community health center, so the findings may not fully reflect the use of online registration services in other healthcare settings with different demographic and organizational characteristics. Future studies are recommended to use broader sampling methods, involve multiple healthcare facilities, and apply longitudinal or mixed-method approaches to obtain a more comprehensive understanding of digital health service utilization.

## CONCLUSIONS

This study highlights that age, education, occupation, attitude, perceived needs, and ease of obtaining information significantly influence the utilization of the PUSTAKA online registration service. These findings contribute to the understanding of factors affecting the actual use of digital health services at community health centers, particularly in the context of online registration systems. Several recommendations can be made, such as simplifying the registration process, adding an interactive question-and-answer feature, or adding a frequently asked questions (FAQ) section to help users. Future research is recommended to explore additional behavioral and technological factors influencing service utilization and to evaluate the effectiveness of intervention strategies to increase public adoption of digital health services.

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## DATA AVAILABILITY

The datasets generated and/or analyzed during the current study are available from the corresponding author upon reasonable request.

## AI DISCLOSURE STATEMENT

This manuscript was edited using AI-assisted tools (Paperpal) solely to improve language clarity, grammar, and flow. AI generated no academic content. The command used was "Rephrase the sentence for clarity". All analyses, interpretations, discussions, conclusions, and recommendations were authored by me and informed by the literature.

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## CONFLICT OF INTEREST

The authors hereby declares that this research is free from conflicts of interest with any party.

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