PEOPLE KNOWLEDGE AND WILLINGNESS OF AUTOMATIC EXTERNAL DEFIBRILLATOR USAGE IN PUBLIC FACILITIES IN THE CAPITAL CITY OF INDONESIA

Fergyanto Efendy Gunawan*, Rama Gilang Perdana
Maria Anntonette Bria Seran and Yonathan

Industrial Engineering Department, BINUS Graduate Program – Master of Industrial Engineering
Bina Nusantara University
Jl. K. H. Syahdan No. 9, Kemanggisan, Palmerah, Jakarta 11480, Indonesia
*Corresponding author: fgunawan@binus.edu

Abstract. *In Indonesia, especially Jakarta, many public facilities such as airports, train stations, bus stations are equipped with the Automatic External Defibrillators (AEDs). The effective use of these AEDs in public places by lay bystanders is important to improve the survival rate. Unfortunately, many people still have limited knowledge about AED and its critical function and lack of willingness to use the device. This research intends to measure the proportion of people in public places who have the knowledge concerning AED device and its use. The relevant data are collected by a survey on a random sample of 400 participants performed at the busiest railway station in Jakarta, Indonesia. The results suggest that almost 65% of them are unaware of the existence of the device in the public places. As many as 35% respondents do not recognize the device, and less than 35% respondents are willing to use the equipment.*
Keywords: Automatic external defibrillator, Public facility, Public awareness

1. **Introduction.** Ischemic heart disease, also known as Coronary Heart Disease (CHD), is the first leading cause of deaths in Indonesia. The number of deaths caused by the disease in 2016 increased by 14.2% over the previous year [1]. CHD or congestive heart failure markedly increases Sudden Cardiac Arrest (SCA) risk in the Indonesian population. About 80% of men who experienced SCA have underlying CHD [2]. Early defibrillation for SCA improves the chance of successful resuscitation and survival [3]. Survival from SCA in the public environment often depends on the use of Automated External Defibrillators (AEDs) [4].

In 2016, Indonesian government regulated that AED in public facilities is a mandatory [5]. Since two years ago, many public facilities such as airport, train station, bus station, and offices especially in Jakarta have provided AED. Increasing public knowledge and willingness to use AED may have important potential to improve outcomes, as studies have demonstrated that AED usages can have as many as double SCA survivals.

Some studies performed in advanced countries such as the Netherlands and Hong Kong found that less than a half of the participants were able to use an AED in an emergency and more than half were unable to recognize an AED [4, 6]. In the US urban community, two thirds (66%) of respondents were able to correctly identify an AED and its purpose [7]. The main reason was the people's poor awareness of AED and the procedure to use it [3]. Only those who had an AED training and the active members of the first aider were ready to use AED when they witnessed SCA events [6]. People were afraid to not correctly use the device and its legal liability [8].

The studies regarding the people knowledge and willingness to use AED devices had been performed frequently in developed countries or cities such as Japan [3], the Netherlands [4], Hong Kong [6], and the United States [7, 8, 9]. Practically, such study has not been performed in developing countries, which have a different socio-economic structure compared with developed countries. This study is performed to fill the gap. The study results are expected to be important for designing programs to increase the public awareness of AED devices in public areas.

This paper is organized as the following. Section 2 presents the description regarding the observation site, and the data collection and analysis method. Section 3 presents the characteristics of the respondents and the major findings of the research. Section 4 presents the implication of the current findings and a comparison to the previous findings. Section 5 presents a few implications and restrictions of the study.

2. **Research Method.** The capital city of Indonesia, Jakarta, is the busiest and largest city in the country. It is a melting pot of people from various backgrounds and cultures. Moreover, it is the center of economy, education, culture, and business. In fact, Jakarta contributes 26% to Indonesian economy [10].

Gambir station is the central station located in Jakarta. It is an extremely busy station. In 2013, the number of passengers in this station increased by 122% from the previous year [10].

We prepare an instrument to collect data for this research. The instrument is adopted from [4], which reported a similar study performed at a railway station in Amsterdam, the Netherlands.

The problem of public knowledge about AEDs is addressed in multi-factorials including the individual's ability to recognize an AED, knowledge about defibrillation in general, and his or her willingness to use public access defibrillation.

The rail station should be equipped with AED devices following the regulation stipulated by the Ministry of Health of Republic of Indonesia [5]. Currently, the station has one AED device installed at a location as shown in Figure 1. The device is near a small emergence response unit. The device is stored in a glass container labeled "AED". The container is attached to a wall. Anyone has access to the device.

In this study, we apply a cluster sampling approach. A zone of the three meters around AED is defined as the cluster, and individuals entering the zone/cluster are invited to participate in such a way that they can not easily recognize they would be interviewed about medicine, resuscitation, or defibrillation [4]. The next individual is interviewed after the previous interview is completed or is refused.

According to PT KAI, the Indonesian national railway company, Gambir station serves 11210 passengers per day on average in 2017. Following, the Slovin formula [11], a sample size of 386 is required.

There are two research interests. Both are related to AED devices. First, it is about people knowledge. Second, it is about their willingness to use the instrument.

There are two questionnaires, namely, Survey A and Survey B. These questionnaires are shared separately to the respondents in order to avoid bias. Both questionnaires consist of three parts. The first part is unique to each questionnaire, whereas parts two and three are shared by both questionnaires. Table 1 summarizes the questionnaire items.

3. **Results.**

3.1. **The characteristics of study subjects.** About 400 participants are involved in this study, 200 participants for each survey. Moreover, 45% of the participants are male and 55% are female with 32 years old as the average age of the participants. In addition, 19% of the participants work in medical fields, while the other 81% work in non-medical fields. Demography of the participants are summarized in Table 2.
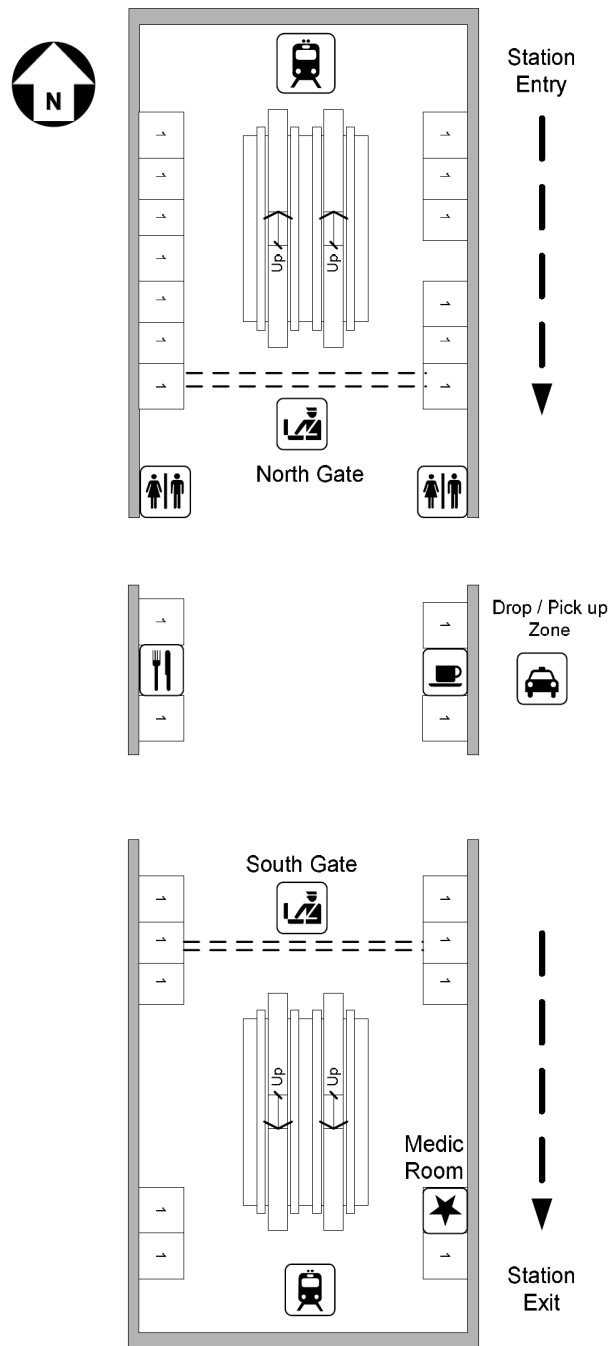
FIGURE 1. The schematic of the observation site (Gambir Station). The star symbol marks the location of the AED device.

3.2. **Major findings.** Based on Survey A, only 21.15% (95% CI 15.07-27.24) of the participants mention AED as the first action in hypothetical SCA situation (see Table 3). Most of them are female and those who are working in medical fields or have the experience of AED training.

From the age perspective, only those in the age range of 25-39 years old (14.74%, 95% CI 9.69-19.79) mention that AED is the necessary device to help people in the above scenario.

Overall, 24.36% (95% CI 28.14-42.37) of the participants choose to "call ambulance" when they witness SCA events. More than half are not aware that AED device is available to public.

Based on Survey B, less than half of the participants or 35.26% (95% CI 28.14-42.37) are able to identify the AED. Majority of them fail to distinguish the AED device from

TABLE 1. The instrument for data collection

A. SURVEY SCENARIO CASE.
   Imagine the following situation: You see that someone is lying on the floor. The person is not breathing, and you suspect that they have had a cardiac arrest (that their heart has stopped beating).
   1. What do you think should be done as quickly as possible?
      (*Multiple answer allowed; ask whether there is something else that should be done as quickly as possible after the participant providing the answer*)
   2. What is defibrillator and what is it used for?
      (*If incorrect or "I don't know": A defibrillator is a device that is used to provide an electrical shock and "restart" the heart if it has stopped beating*)
B. SURVEY PHOTOGRAPH.

   1. Do you know what this is? Do you know the purpose of this device?
      (*Interviewer points the photograph above, if incorrect or "I don't know": A defibrillator is a device that is used to provide an electrical shock and "restart" the heart if it has stopped beating*)
   2. Why has this device been placed here on the wall?
C. ADDITIONAL QUESTION FOR BOTH SURVEYS.
   1. Do you know that in many public places defibrillators are available?
   2. Who do you think is allowed to use such a public available defibrillator?
   3. Would you use such a defibrillator in case of a medical emergency?
   4. Do you agree or disagree with this following statement? "I will use AED even ambulance arrives in 5 minutes"
   5. Do you know that there is Indonesian government policy which stated AED must be available in public access areas?
D. DEMOGRAPHIC QUESTION FOR BOTH SURVEYS.
   1. Have you been trained in a medical profession (for example, physician, nurse, paramedic)?
      If "yes", participants were asked to specify their profession.
      If "no", is first aid part of your professional training (for example, fire fighter, police, flight attendant, soldier)?
   2. Have you had first aid training within the last 5 years? *If "yes", was defibrillation explained during the first aid training?*
   3. Did you ever have a special AED training?
   4. Sex
   5. How old are you?

TABLE 2. Demographic data of the participants ($n = 400$)

Gender	
Male	182 (45.5%)
Female	218 (54.5%)
Age (year)	
< 25	120 (30.0%)
25-39	203 (50.8%)
40-59	77 (19.3%)
Education	
Junior High School	18 (4.5%)
Senior High School	44 (11.0%)
Bachelor Degree	289 (72.3%)
Master Degree	49 (12.3%)
Occupation	
Layperson	323 (80.8%)
Professional (Trained in medical profession)	77 (19.2%)

TABLE 3. Questions specific in survey A ($n = 200$). All data are in percent. The data in brackets are the 95% confidence interval.

	First Action in hypothetical SCA situation			Instantly mentioned defibrillation	Knowledge about the use of AED
	Call Ambulance	Call People Around	Perform CPR		
All Participants	24.36 (28.14-42.37)	45.51 (38.1-52.93)	8.33 (4.22-12.45)	21.15 (15.07-27.24)	35.26 (28.14-42.37)
Gender					
Male	16.03 (10.85-21.2)	11.54 (6.95-16.12)	7.05 (3.32-10.78)	10.26 (5.88-14.63)	12.82 (8.05-17.6)
Female	8.33 (4.3-12.36)	35.26 (29.09-41.43)	2.56 (0.22-4.9)	10.90 (6.39-15.41)	22.44 (16.65-28.22)
Age (year)					
< 25	4.49 (1.46-7.52)	17.31 (12.1-22.51)	5.77 (2.37-9.17)	3.21 (0.61-5.8)	7.05 (3.34-10.76)
25-39	13.46 (8.58-18.35)	20.51 (14.9-26.13)	3.21 (0.6-5.81)	14.74 (9.69-19.79)	21.79 (16.09-27.5)
40-59	6.41 (2.87-9.96)	8.97 (4.89-13.06)	0.64 (−0.54-1.83)	3.21 (0.62-5.79)	4.49 (1.46-7.51)
Education					
Junior High School	0.00 (0.00-0.00)	3.85 (1.04-6.65)	0.64 (−0.54-1.83)	0.00 (0.00-0.00)	0.00 (0.00-0.00)
Senior High School	0.00 (0.00-0.00)	8.97 (4.91-13.04)	0.64 (−0.54-1.83)	1.92 (−0.1-3.95)	1.28 (−0.38-2.95)
Bachelor Degree	23.08 (17.07-29.09)	30.77 (24.33-37.21)	7.05 (3.28-10.82)	13.46 (8.49-18.43)	26.28 (20.06-32.51)
Master Degree	1.28 (−0.38-2.95)	3.21 (0.62-5.79)	1.28 (−0.38-2.95)	5.77 (2.39-9.15)	5.77 (2.39-9.15)
Occupation					
Layperson	23.08 (16.99-29.17)	42.95 (36.13-49.77)	6.41 (2.79-10.03)	7.69 (3.76-11.63)	16.03 (10.66-21.39)
Professional (Trained in medical profession)	1.28 (−0.38-2.95)	3.85 (1.03-6.66)	3.21 (0.62-5.79)	13.46 (8.71-18.21)	19.23 (13.96-24.51)

the general first aids boxes. Moreover, some of the participants say they just see the AED for the first time. A small portion of 19.23% (95% CI 13.96-24.51) who are able to identify AED device works in medical fields. Similar to that in Survey A, 21.79% (95% CI 16.09-27.5) of those participants in the age range of 25-39 years old know about the device.

The general responses for both surveys are showed in Table 5. Overall, 47.44% of the participants are not aware that the AED can be used by everyone. They believe that only people who have experience in medical fields, such as doctors, nurses, are able to use AED. Majority of the participants who know that AED can be used by everyone are those working in medical fields (19.23%, 95% CI 13.96-24.51). The study also reveals that only 44.87% (95% CI 37.47-52.28) of the participants have willingness to use AED if they face SCA. More than half of them (55.13%, 95% CI 47.72-62.53) choose not to use AED. Laypeople are the majority who willing to use AED. They will use AED if they have sufficient knowledge about it.

4. **Discussion.** The aim of this research is to investigate the knowledge and willingness for the AED usage in public. This study is conducted in Jakarta, the capital city of Indonesia. Overall, the result of this study reveals that the participants lack knowledge

TABLE 4. Questions specific in survey B ($n = 200$). All data are in percent. The data in brackets are the 95% confidence interval.

	Able to Identify AED/Defibrillator
All Participants	35.26 (28.14-42.37)
Gender	
Male	11.54 (6.95-16.12)
Female	23.72 (17.85-29.59)
Age (year)	
< 25	8.97 (4.87-13.08)
25-39	21.79 (16.09-27.5)
40-59	4.49 (1.46-7.51)
Education	
Junior High School	0.00 (0.00-0.00)
Senior High School	1.28 ($-$0.38-2.95)
Bachelor Degree	26.28 (20.06-32.51)
Master Degree	7.69 (3.87-11.51)
Occupation	
Layperson	16.01 (10.66-21.39)
Professional (Trained in medical profession)	19.23 (13.96-24.51)

TABLE 5. Questions asked in both surveys ($n = 200$). All data are in percent. The data in brackets are the 95% confidence interval.

Participants	Knowledge about Public Access Defibrillator Regulation in Indonesia	Believes that Anyone Is Allowed to Use an AED	Would You Use an AED	
			Yes	No
All Participants	30.13 (23.3-36.96)	52.56 (45.13-60)	44.87 (37.47-52.28)	55.13 (47.72-62.53)
Gender				
Male	12.82 (8.05-17.6)	24.36 (18.55-30.16)	24.36 (18.8-29.92)	21.15 (15.75-26.55)
Female	17.31 (11.95-22.67)	28.21 (22.13-34.28)	20.51 (15.15-25.87)	33.97 (28.24-39.71)
Age (year)				
< 25	5.77 (2.37-9.17)	18.59 (13.28-23.9)	24.36 (18.8-29.92)	21.15 (15.75-26.55)
25-39	19.23 (13.72-24.74)	25.64 (19.72-31.56)	20.51 (15.15-25.87)	33.97 (28.24-39.71)
40-59	5.13 (1.92-8.34)	8.33 (4.37-12.3)	0.00 (0.00-0.00)	0.00 (0.00-0.00)
Education				
Junior High School	0.00 (0.00-0.00)	3.21 (0.62-5.79)	24.36 (18.8-29.92)	21.15 (15.75-26.55)
Senior High School	1.92 ($-$0.1-3.95)	6.41 (2.88-9.94)	20.51 (15.15-25.87)	33.97 (28.24-39.71)
Bachelor Degree	21.15 (15.3-27.01)	33.33 (26.81-39.85)	0.00 (0.00-0.00)	0.00 (0.00-0.00)
Master Degree	7.05 (3.37-10.73)	9.62 (5.44-13.80)	0.00 (0.00-0.00)	0.00 (0.00-0.00)
Occupation				
Layperson	10.90 (6.31-15.48)	13.46 (8.467-18.47)	24.36 (18.8-29.92)	21.15 (15.75-26.55)
Professional (Trained in medical profession)	19.23 (13.96-24.51)	19.23 (13.96-24.51)	20.51 (15.15-25.87)	33.97 (28.24-39.71)

and willingness to use the AED. Less than half of the participants have an insufficient knowledge regarding the public access defibrillator in Indonesia. Approximately 40% of the participants can identify the AED.

These findings are similar with [7], which reported that approximately 40% of the participants in the US were unable to identify an AED. This study reveals that the knowledge about AED is limited by the age, education, and the occupation of the participants. Moreover, the participants who are between 20-39 years know more about the function of AED than the participants in between 40-59 years old. Then, the participants who have education background in bachelor degree and work in any medical fields are able to identify the function of AED.

Another finding of this study is that the majority of the participants suggest to call for help as an immediate action in emergency situation of SCA; meanwhile, only 21.15% of

the participants will spontaneously mention AED as the first step to do in an emergency situation. This finding is aligned with the previous results which reveal that only 35.26% of the participants are able to identify the functions of AED. The findings can conclude that the participants who spontaneously mention AED in emergency situation, have more knowledge about AED function. Not surprisingly, this study reveals that the participants working in the medical fields are the majority who mention AED in an emergency situation.

Merely 44.87% of participants have willingness to use AED. Some participants refuse to use AED because they do not know how to operate an AED and they do not want to take the risk of harming one's life if they use an AED. However, the majority of the participants who have willingness to use AED are laypeople or participants work in non-medical fields. They will use AED if they have sufficient knowledge and techniques to use it correctly.

Precisely in 2016, the Indonesian government has officially announced a regulation regarding AED that the installation and application of AED in any public places are compulsory. However, more than half of the participants are not aware about this regulation. This clearly shows why the Indonesian citizens are lack of knowledge regarding the use of AED. Additionally, merely 52.56% of the participants, the ones working in the medical fields are the majority who are aware that AED is accessible for everyone including the layperson. This condition may occur because they have enough knowledge regarding AED and get government socialization about AED regulation.

Based on this study, almost all of the lay participants state that they have never gained any training regarding the application of AED. Some of the office workers even state that AED has not been implemented in their offices yet.

Lack of public education remains as an obstacle that may impede public access defibrillation implementation in Indonesia. Resuscitation investigators have previously suggested that AED public messaging could be applied at airports, stations or even on aircraft [9]. Implementation of AED socialization and training is one of methods that can improve the public knowledge to use AED. In fact, several studies demonstrate how simple AEDs are to operate [12, 13]. In simulated studies, even untrained sixth grade children can deliver a shock in a timely fashion with an AED. Roppolo et al. [13] showed that only 30 min of training was sufficient to allow laypeople to apply an AED. The present study also shows that most students will be willing to operate an AED if they have better knowledge regarding its use.

Furthermore, it is extremely important for the government to clearly socialize the AED regulation to public. The government must emphasize that AED is accessible for everyone and legally can be used by everyone. As a result, the public will surely be more confident in taking on a role to help the victims of SCA.

Our study reveals that the public has not been sufficiently socialized yet. Wide-scale public information campaigns are the next important step to exploit the lifesaving potential of public access defibrillation.

5. **Conclusion.** The study reveals that only a small portion of the surveyed individual has the knowledge regarding AED device. Among them, only a few are able to respond effectively in a SCA scenario by choosing to use AED device. Willingness to use the device is also low. It is extremely important for the government to socialize the regulation regarding AED and to increase the public knowledge about its usage.

We adopted the questionnaire from a study conducted by [4]. The questionnaires were repeatedly evaluated for clarity, conciseness, and ambiguousness and were evaluated in pilot interviews. Another limitation in this study is that we could not verify all participants who stated to use AED when dealing with SCA will actually use the AED in that situation. On the other hand, the study is not assessed by the people of the population

(maturity, physical capacity, greater functional differences between close-lying-ages, and others).

REFERENCES

[1] K. Kesehatan, *Health Data: Indonesia*, Institute for Health Metrics and Evaluation, http://www. healthdata.org/indonesia, 2018.

[2] R. Deo and C. M. Albert, Epidemiology and genetics of sudden cardiac death, *Circulation*, vol.125, no.4, pp.620-637, 2012.

[3] T. Taniguchi, W. Omi and H. Inaba, Attitudes toward automated external defibrillator use in Japan, *Resuscitation*, vol.79, no.2, pp.288-291, 2008.

[4] P. Schober, F. B. van Dehn, J. J. Bierens, S. A. Loer and L. A. Schwarte, Public access defibrillation: Time to access the public, *Annals of Emergency Medicine*, vol.58, no.3, pp.240-247, 2011.

[5] K. Kesehatan, *Kementrian Kesehatan Republik Indonesia, Peraturan Menteri Kesehatan Nomor 56 Tahun 2016*, 2016.

[6] K. Fan, L. Leung, H. Poon, H. Chiu, H. Liu and W. Tang, Public knowledge of how to use an automatic external defibrillator in out-of-hospital cardiac arrest in Hong Kong, *Hong Kong Med. J.*, vol.22, no.6, pp.582-588, 2016.

[7] M. Gonzalez, M. Leary, A. L. Blewer, M. Cinousis, K. Sheak, M. Ward, R. M. Merchant, L. B. Becker and B. S. Abella, Public knowledge of automatic external defibrillators in a large US urban community, *Resuscitation*, vol.92, pp.101-106, 2015.

[8] J. Lubin, S. S. Chung and K. Williams, An assessment of public attitudes toward automated external defibrillators, *Resuscitation*, vol.62, no.1, pp.43-47, 2004.

[9] J. P. Ornato, Getting lay rescuers to use public access defibrillators, *Annals of Emergency Medicine*, vol.58, pp.248-249, 2011.

[10] Kompas, *The Recor of Commuter Line KRL Passenger Reaches 1 Million People per Day*, http:// megapolitan.kompas.com/read/2017/06/20/20343781/rekor.penumpang.krl.commuter.line.capai.1. juta.orang.per.hari, Retrieved on Juny 20, 2017.

[11] E. Stephanie, *Slovin's Formula Sampling Techniques*, Houghton-Mifflin, New York, USA, 2003.

[12] J. Kelley, P. B. Richman, G. A. Ewy, L. Clark, B. Bulloch and B. J. Bobrow, Eighth grade students become proficient at CPR and use of an AED following a condensed training programme, *Resuscitation*, vol.71, no.2, pp.229-236, 2006.

[13] L. P. Roppolo, P. E. Pepe, L. Campbell, K. Ohman, H. Kulkarni, R. Miller, A. Idris, L. Bean, T. N. Bettes and A. H. Idris, Prospective, randomized trial of the effectiveness and retention of 30-min layperson training for cardiopulmonary resuscitation and automated external defibrillators: The american airlines study, *Resuscitation*, vol.74, no.2, pp.276-285, 2007.