Understanding Public Awareness and Acceptance of AED Implementation

Wang Zining[1], Liu Chunyan[2], Xu Jing[#1]

[1]School of Journalism and Communication, Peking University, Beijing, China.

[2]School of Journalism and Communication, Tsinghua University, Beijing, China.

Corresponding author

Xu Jing (xujing@pku.edu.cn)

Abstract

Objective: To conduct a nationwide survey examining public awareness, exposure, and willingness to undergo training related to Automated External Defibrillators (AEDs), while exploring factors influencing participation in AED training.

Methods: A national questionnaire survey was performed using stratified random sampling, yielding 2039 valid samples. Descriptive statistics were supplemented with regression analysis and structural equation modeling.

Results: Public awareness of AEDs and media promotion efforts remain at an initial stage. Gender, region, age, and living situation significantly influence public awareness of AEDs. Communication approaches, media channels, and self-efficacy exert effects on public awareness of AEDs and training willingness.

Conclusion: The dissemination of AEDs, as a vital initiative pertaining to public health, necessitates profound engagement in health communication. Within this framework, selecting media channels with high public trust for science popularization, fostering the development of social support factors, and enhancing awareness rates will assume a pivotal role.

Keywords:AED Dissemination; Media Exposure; Health Communication; Structural Equation Modeling

1. Introduction

The "Healthy China 2030" Planning Outline proposes relevant requirements for "strengthening health education." The scope of health education should encompass

not only health literacy and scientific health knowledge but also the training and dissemination of usage methods for common medical devices, with particular emphasis on the training and popularization of medical emergency facilities. The widespread dissemination and promotion of medical emergency facilities exemplified by Automated External Defibrillators (AEDs) can effectively enhance the capacity for sanitary emergency response in sudden incidents, thereby saving the precious lives of more patients.

At the public level of AED dissemination and promotion, participation in training represents a critical step in achieving the transformation from willingness to actual behavior. What is the level of awareness of AEDs among residents nationwide? What factors influence AED training in China? No researchers have yet provided effective answers to these questions, which constitute the research problems addressed in this article.

2. Data Sources and Methods

2.1 Study Subjects

Adult urban residents from various regions nationwide.

2.2 Research Methods

This article employs a questionnaire survey method to conduct a nationwide investigation on AED awareness, exposure, and training willingness.

This survey targeted residents nationwide and utilized the EPanel sample database for stratified random sampling. In terms of stratification, this survey primarily set certain conditions for gender, occupation, and place of residence. Specifically, regarding gender, the survey aimed for an approximately equal proportion of males and females; regarding occupation, full-time student samples accounted for about 30%; regarding place of residence, the survey divided places of residence into four tiers: first-, second-, third-, and fourth-tier cities, with equal proportions for each tier.

From April 28 to May 12, 2022, this survey collected a total of 2060 samples. After excluding 21 samples with regular response patterns, 2039 valid samples were

obtained, yielding an effective recovery rate of 98.98%.

2.3 Data Processing

This study used Stata 17.0 MP for sample organization and statistical analysis. In the regression analysis section, the third-party sgmediation method was employed to analyze mediation effects. For structural equation modeling, Stata 17.0 MP's SEM Builder was used for graphical visualization modeling.

3. Results

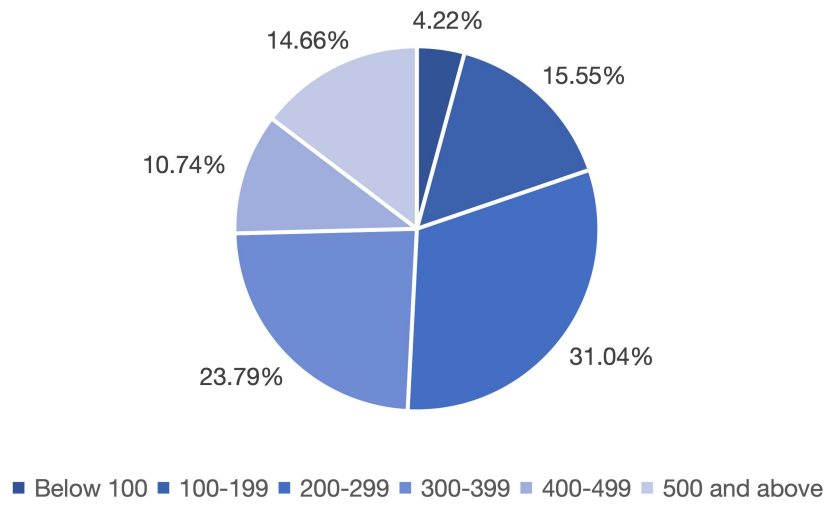
3.1 Overview of Public Awareness in China's AED Promotion

3.1.1 Awareness of Quantity

As illustrated in Figure 1, after presenting data on AED possession per 10,000 people in major developed countries, populous nations, and China's current status, this survey examined respondents' subjective judgments regarding the appropriate number of AEDs per 100,000 people in China. Nearly one-third of respondents considered that the number of AED devices per 100,000 people in China should range from 200 to 299 units. For reference, the average AED possession in the United States is approximately 700 units per 100,000 people, while in Japan it is approximately 390 units [1][2]. Furthermore, nearly half of the respondents believed that China's AED possession per 100,000 people should exceed 300 units.

Figure 1

Statistics on public expectations for AED quantity per 100,000 people in China

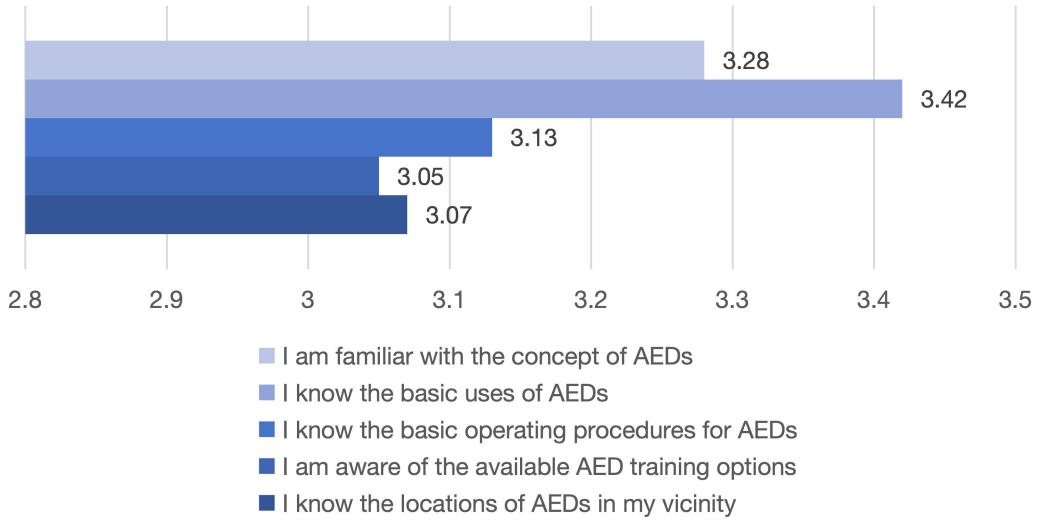


3.1.2 Awareness Level Remains at an Initial Stage

Regarding the concept and basic uses of AEDs, respondents demonstrated awareness levels exceeding the median value. However, when delving into deeper awareness issues such as AED usage methods, access routes, and installation locations, respondents' average awareness levels hovered around the median, as shown in Figure 2. Additionally, 171 respondents selected "strongly disagree" for all five awareness-related questions (verified to have no regular response issues), indicating essentially no awareness of AEDs. This suggests that the current public awareness of AEDs remains at a very initial stage, with overall awareness levels being moderate.

Figure 2

Bar chart of AED awareness status (1-5 Scale, 5 = Strongly Agree)



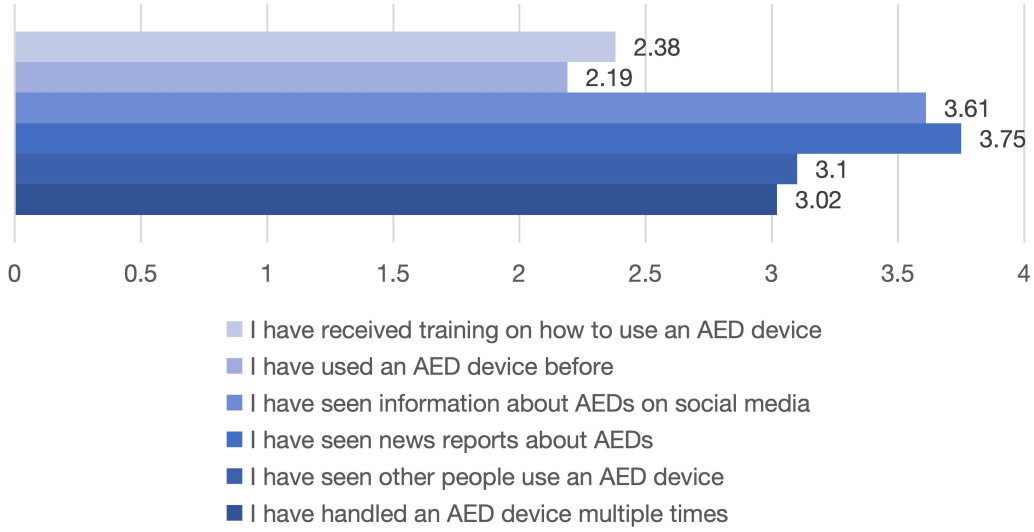
3.1.3 Media Promotion at an Initial Stage

As an emergency device applied in real life, public exposure to AEDs influences both awareness and, to a large extent, the willingness to undergo deeper training. As seen in Figure 3, obtaining AED-related information from news media and social media showed higher levels among the sample group, indicating a relatively high level of media exposure to AEDs. However, in terms of on-site exposure, the overall level in the sample was low, particularly regarding usage situations and training acceptance, where mean values were significantly below the median. This indicates that the high media exposure level reflects active promotion of AED science popularization by

current AED dissemination proponents across various media, aligning with the results analyzed in previous sections of this report. However, due to small training scales, low frequency, and low actual AED coverage rates, public on-site exposure to AEDs remains low.

Figure 3

Bar chart of AED media exposure (1-5 Scale, 5 = Strongly agree)

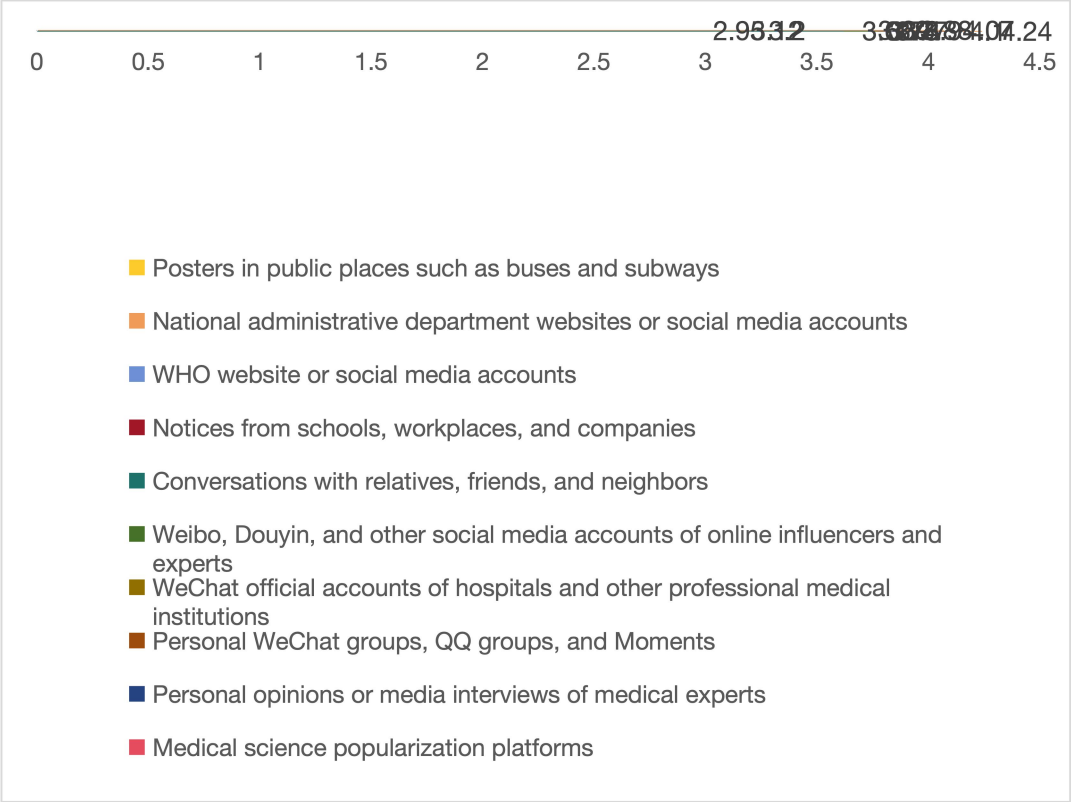


3.1.4 Loss of Dissemination in Supportive Factors

This study investigated public willingness to provide rescue in five scenarios. As shown in Figure 4, regardless of possessing AED usage skills, respondents were more inclined to rescue relatives and friends rather than strangers, which aligns with general empirical knowledge.

Figure 4

Bar Chart of Media Channel Trust Status (1-5 Scale, 5 = Strongly Agree)



Notes. Data on "posters and advertisements in public places such as buses and subways" is missing, therefore they are not shown in the figure.

3.2 Group Differences in Public Awareness

Regarding gender, variance analysis results showed significant differences between males and females in overall AED exposure status ($F=15.05$, $P<0.01$), as well as in the subdivided aspects of on-site exposure ($F=8.59$, $P<0.001$) and media exposure ($F=6.38$, $P<0.05$).

Regarding age, variance analysis results indicated significant differences among age groups in willingness to pay for AED training, except between the 18-25 and 26-35 age groups ($P>0.05$) ($F=34.32$, $P<0.01$). Specifically, the 36-45 age group (mean=3.162) and the 46 and above age group (mean=3.870) showed markedly lower willingness to actively undergo training when payment is required.

Regarding region, in subjective judgments on how many AEDs China should have per 100,000 people, respondents from first- and second-tier cities had significantly lower subjective estimates compared to those from third- and fourth-tier cities, with this difference being statistically significant (Pearson Chi-square=50.4389,

P<0.01).

Regarding different living situations, this article conducted variance analysis on living situations and training willingness. Results showed that respondents in different living situations exhibited statistically significant differences in training willingness (F=28.85, P<0.01). Specifically, respondents living with family had the strongest training willingness (mean=4.021), while those sharing rentals with strangers had the lowest (mean=3.591). This reflects that public perception of the necessity of mastering first-aid skills significantly influences their willingness to undergo AED training.

Table 1

Group differences in public awareness

Factors	Mean	Std. dev.	Freq.	F	df	P
Dependent variable: Willingness to receive training						
Living situation				28.85	3	<0.01
Living alone	3.8614	0.7074	226			
Living with family	4.0211	0.6725	1538			
Living with friends	3.6136	0.7522	264			
Sharing an apartment with strangers	3.5909	0.6118	11			

3.3 Core Factors Influencing Public Awareness

Although the above sections have preliminarily addressed some research questions, they are limited to discussions of relationships between two factors without placing the issues in the context of interactions among more factors. Therefore, this article will employ regression analysis and structural equation modeling to conduct in-depth analysis of the research questions.

3.3.1 Mismatch in Existing Dissemination and Promotion Media Channels

To more comprehensively examine the various factors influencing training willingness, this report employed linear regression, designating training willingness (willingness to receive training) as the dependent variable and awareness status (perception), media exposure (media engagement), self-efficacy (self-efficacy), trust in individualized communication channels (individual comm), and trust in mass communication channels (mass comm) as independent variables, thereby constructing a regression model. In the sample description and preliminary statistics, this report identified that the variables of gender (i.gender) and living situation (i.living status) exerted some influence on willingness to participate in training; consequently, these two variables were incorporated into the model as dummy variables. The model is presented as follows:

$$willingness\ of\ training=\beta_1*perception+\beta_2*media\ engagement+\beta_3*self\ efficacy+\beta_4*individual\ comm+\beta_5*m$$

However, as the preliminary regression results indicated the presence of heteroscedasticity in the model, this report opted to employ Feasible Generalized Least Squares (FGLS) regression to construct the model. This involved taking the logarithm of the residuals (uhat) from the original model and using it as a new dependent variable (logu) in an auxiliary regression; obtaining the predicted values for the dependent variable (ghat); exponentiating these to generate the factor hhat; dividing each variable from the original model by the square root of hhat to produce transformed variables; and subsequently performing linear regression without an intercept term. The model is presented as follows:

$$willingness\ of\ training^*=\beta_1*perception^*+\beta_2*media\ engagement^*+\beta_3*self\ efficacy^*+\beta_4*individual\ comm^*+\beta$$

After standardizing the regression coefficients (z-scores), this article concludes that, as shown in Table 1, the standardized regression results indicate that an increase in awareness level can significantly enhance willingness to undergo training. However, as media exposure increases, training willingness significantly decreases. For each unit increase in trust in individualized communication channels, training willingness rises by 0.0457 standard units, whereas for each unit increase in trust in

mass communication channels, training willingness rises by 0.166 standard units. Evidently, the non-positive effect of current media exposure is largely attributable to the scarcity of mass communication channels. This scarcity prevents individuals from accessing information they perceive as credible, resulting in greater exposure to AED-related media information increasingly offsetting their willingness to participate in training

Table 2

FGLS regression results for factors influencing training willingness

Variables	Training willingness
Cognitive status	0.166***
	(0.227)
Media exposure	-0.206***
	(-0.195)
Self-efficacy	0.771***
	(0.799)
Trust in individualized communication channels	0.0466***
	(0.0457)
Trust in mass communication channels	0.182***
	(0.166)
Female	0.427***
	(0.104)
Living with family	1.175***
	(0.247)
Living with friends	0.809***
	(0.133)
Living with strangers	0.936**
	(0.0335)

Observed sample (N)	2,039
Adjusted R-squared	0.977
F	9588
Standardized coefficients are shown in parentheses	
*** p<0.01, ** p<0.05, * p<0.1	

3.3.2 Positive Mediating Role of High-Trust Media Channels

Trust in media channels plays a mediating role in the process whereby various factors influence willingness to participate in AED training. To verify this mediating effect, this report sequentially employed the Sobel test and the Bootstrap test for confirmation.

As shown in Tables 2 and 3, the Sobel test results demonstrate that the mediating role of media channel trust is statistically significant ($P < 0.01$), accounting for 30.14% of the total effect.

For greater rigor, this study further applied the Bootstrap method, which involves resampling with replacement from the sample to examine the presence of the mediating effect.

As presented in Table 4, in the Bootstrap test, this report continued to designate media trust as the mediating variable (ind_eff). Examination of the confidence intervals indicates that both the indirect effect and the direct effect are statistically significant (the confidence intervals do not include 0).

Table 3

Sobel test regression results

Variables	Training willingness
Media trust	0.443***
	(0.378)
Media exposure	0.068***
	(0.097)
Cognitive status	-0.032**

	(-0.052)
Self-efficacy	0.326***
	(0.345)
Gender	0.055**
	(0.039)
Intercept term	1.184***
Observed sample (N)	2,039
Adjusted R-squared	0.423
F	299.400
Standardized coefficients are shown in parentheses	
*** p<0.01, ** p<0.05, * p<0.1	

Table 4

Sobel test mediating effect results

	Coefficient	Standard Error	Z	P>|Z|
Sobel	0.029	0.007	4.375	0.00
Goodman-1	0.029	0.007	4.369	0.00
Goodman-2	0.029	0.007	4.381	0.00

Percent of total effect that is mediated: 30.14 %

Ratio of indirect to direct effect: 0.4313

Table 5

Bootstrap mediating effect test results

Bootstrap Results		Observed sample （N） =2039 Number of samples=1000			
_bs_1:r(ind_eff) _bs_2:r(dir_eff)					
Observed coefficient	Bootstrap Standard error	Z	P>|Z|	95% interval	Confidence

_bs_1	0.0292061	0.0072396	4.06	0.000	0.0150168	0.0433955
_bs_2	0.0677088	0.0172459	3.93	0.000	0.0339075	0.1015101

3.3.3 Interactive Effects of Exposure, Trust, and Self-Efficacy

Although regression analysis and mediating effect tests have preliminarily yielded the influence of media channel trust on training willingness, as well as the positive influences of self-efficacy and awareness status on training willingness, due to the presence of multiple variables, this report attempts to use structural equation modeling to further explore the relationships among awareness, exposure status, media channel trust, self-efficacy, and training willingness.

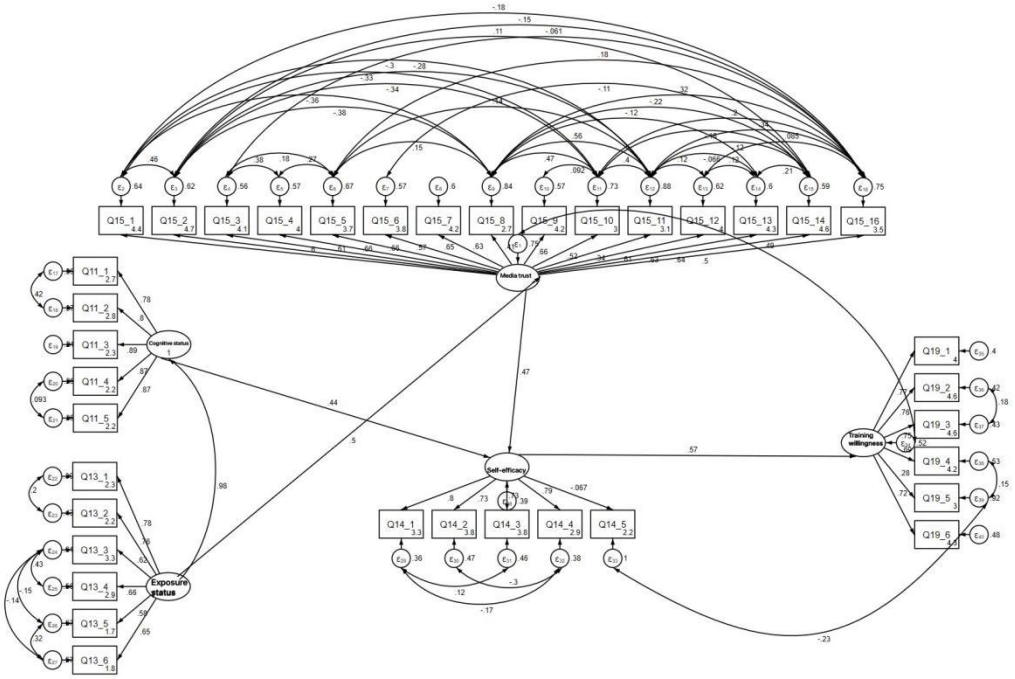
Treating awareness status, exposure status, media channel trust, self-efficacy, and training willingness as latent variables, with the scale items measuring them as observed variables, calculating covariances between necessary observed variables, and standardizing path coefficients, the model for this article was obtained, as shown in Figure 5.

In terms of model fit, the RMSEA value is 0.049 (generally, RMSEA < 0.05 indicates good model fit), and the CFI value is 0.933, exceeding the critical value of 0.9. From the model diagram, it can be seen that paths between latent variables are significantly present and all positive. Notably, deeper exposure status, after positive moderation by media trust, can transform into higher self-efficacy, thereby positively influencing training willingness. This indicates that in the process of AED dissemination, exposure to AEDs, trust in information from various media channels, and self-efficacy do not independently influence training willingness.

Combining the results of mediating effect analysis, regression analysis, and structural equation modeling, one judgment that can be made regarding the progress of AED dissemination in China is that in enhancing self-efficacy to strengthen training willingness and increasing public awareness of AED importance, media channel trust plays an indispensable role. Selecting media trusted by the public can achieve twice the result with half the effort.

Figure 5

Structural equation model results



4. Discussion

In the selection of media channels for AED dissemination and promotion, official media channels of the state and government, as well as those of professional medical institutions and experts, receive greater public trust, which can translate into stronger self-efficacy and greater willingness to participate in AED training. Therefore, in media channel selection, these channels with high public trust should serve as the primary pathways for dissemination.

In the process of AED dissemination, public awareness exhibits significant gender and urban tier differences, and the current AED coverage rate also significantly influences public behavioral choices in accepting AED training. Although dissemination, science popularization, and media promotion can play a substantial role in AED dissemination, essential objective conditions cannot be overlooked—particularly increasing AED coverage rates and cultivating promotive social factors, such as reducing time and monetary costs for AED training.

The purpose of AED dissemination and promotion is to enable more people to

actively provide rescue in cardiac arrest-related emergencies under conditions with efficient and convenient first-aid equipment (such as AEDs), thereby seizing the "golden four minutes" and reducing accidental mortality rates. In this regard, rescue willingness is a crucial factor. The level of rescue willingness largely depends on the presence of social support factors, such as protections under "Good Samaritan laws." Therefore, in advancing AED dissemination, equal emphasis should be placed on cultivating social support factors related to first-aid behaviors, providing rescuers with more legal and policy protections, allowing mastery of AED skills to truly translate into improvements in the scientific nature and increase in the quantity of rescue behaviors, thereby achieving the overall goal of reducing accidental mortality rates. From the perspective of health communication, the cultivation of such social support factors also cannot proceed without the role of communication. Although "Good Samaritan laws" already exist, survey data from this investigation show that public awareness rates are less than half, which is importantly related to the dissemination of laws and policies.

Based on the analysis of the above survey data, this article contends that AED dissemination, as a critical endeavor concerning public health, cannot proceed without deep involvement in health communication. In this process, selecting media channels with high public trust for science popularization, promoting the cultivation of social support factors, and enhancing awareness rates will play a pivotal role.

References

Liao, Y. Z., Chen, Z. Q., & Zhang, H. J. (2018). Zidong tiwai chuchanyi de yanjiu ji yingyong jinzhan [Research and application progress of automated external defibrillators]. *Zhongguo Xinzang Qibo yu Xindian Shengli Zazhi [Chinese Journal of Cardiac Pacing and Electrophysiology], 32*(1), 82–84. https://doi.org/10.13333/j.cnki.cjcpe.2018.01.020

Ringh, M., Hollenberg, J., Palsgaard-Moeller, T., Aneman, A., Bohm, K., Claesson, A., Djarv, T., Haglund, M., Hjelte, F., Nordberg, P., Svensson, L., & Schvartsman, A. (2018). The challenges and possibilities of public access defibrillation. *Journal of Internal Medicine, 283*(3), https://doi.org/10.1111/joim.12730