



Do Media and Family Planning Communication Matter? Evidence on Contraceptive Use among Women of Reproductive Age Using Propensity Score Matching

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ABSTRACT

Background: Indonesia continues to face stagnation in contraceptive use and high maternal mortality despite long-standing family planning programs. The effectiveness of family planning communication varies across information channels, and existing studies largely rely on conventional regression methods that are vulnerable to selection bias.

Methods: This study utilizes cross-sectional data from the 2017 Indonesian Demographic and Health Survey, focusing on married women aged 15–49 with a total 49,627. A Propensity Score Matching approach is applied to reduce selection bias by constructing comparable socio-demographic characteristics. The analysis evaluates exposure to six family planning information channels: radio, television, newspapers or magazines, family planning field officers, internet use, and frequency of internet use.

Result: The findings indicate substantial variation in the effectiveness of communication channels. Television exposure and direct communication from family planning field officers significantly increase the likelihood of contraceptive use with 95% CI 0,0318-0,0568 and 0,0425-0,1123. Internet-based exposure is associated with a lower probability of contraceptive use, suggesting challenges related to misinformation and unverified digital content.

Conclusion: The study demonstrates that the impact of family planning communication depends strongly on the modality and credibility of information sources. Interpersonal counseling and audiovisual media remain the most effective strategies for promoting contraceptive adoption. These results provide new causal evidence to inform more targeted and effective family planning communication strategies in Indonesia.

Keywords: Media exposure; Family planning; Contraceptive use; Woman; Propensity score matching.

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Introduction

Indonesia is the fourth most populous country in the world in 2025. Rapid population growth has serious implications for the social and economic order, including increased poverty, declining health care, reduced access to education, and impacts on environmental sustainability.^{1,2,3} Therefore, family planning (FP) programs are a crucial agenda to minimize unwanted pregnancies and are a strategic effort to reduce population growth.¹ The family planning program aims to create small, quality families according to socio-economic strength.⁴

Although Indonesia was once regarded as a global leader in family planning, as reflected in the sharp decline in the total fertility rate from 5,6 children per woman in 1967–1970 to 2,6 in 2007, this progress has stagnated in recent decades.^{5,6} The Contraceptive Prevalence Rate (CPR) in Indonesia have increased only slightly, reaching around 57% in 2007 and remaining at 57% in 2017.⁷ One strategy to overcome this stagnation and meet the government's target of reducing the total fertility rate to 2,1 by 2025 is to optimize the use of effective contraceptive methods, particularly Long-Term Contraceptive Methods, which are highly effective in preventing pregnancy.⁴

In 2023, more than 700 women died each day from preventable complications related to pregnancy and childbirth, which is equivalent to nearly one death every two minutes worldwide. Around 87% of all maternal deaths worldwide equivalent to roughly 225,000 cases were concentrated in Sub-Saharan Africa and South Asia. Although the global maternal mortality ratio has declined by about 40% since 2000, over 90% of these deaths continue to occur in low- and lower-middle-income countries.⁸ In the same year, the number of maternal deaths in Indonesia was recorded at 4,129 cases, according to the Ministry of Health's Maternal Perinatal Death Notification (MPDN) data, up from 4,005 cases in 2022. The maternal mortality ratio in January 2023 reached approximately 305 per 100,000 live births. With this rate, Indonesia ranks as the country with the second highest maternal mortality in the ASEAN region.⁹

According to BPS 2020 data, the Maternal Mortality Rate (MMR) from the SP2020 Long

Form reveals striking regional disparities among Indonesia's provinces. The province with the lowest MMR is DKI Jakarta And DI Yogyakarta, reflecting better quality maternal health services, more equitable access to health facilities, and relatively high socioeconomic conditions. Conversely, provinces in eastern Indonesia recorded very high maternal mortality rates, especially Papua and West Papua, demonstrating significant challenges related to limited health infrastructure, difficult geographic access, and disparities in health workers. Other provinces that also recorded high maternal mortality rates include East Nusa Tenggara, West Sulawesi, and Gorontalo. Meanwhile, most provinces in Sumatra and Java are in the 170–200 range, reflecting still significant levels of maternal risk. Overall, this pattern indicates that reducing maternal mortality in Indonesia still faces significant spatial obstacles, particularly in underdeveloped, frontier, and outermost regions. Therefore, more targeted maternal health interventions, equitable distribution of medical personnel, and increased access to safe delivery services are needed.¹⁰

Family planning programs have made a significant contribution to saving women's lives. Globally, Family Planning Program It is estimated that family planning programs can prevent up to 30% of maternal deaths.¹¹ Furthermore, family planning programs are estimated to contribute to reducing maternal mortality rates in various countries, with reduction impacts ranging from 6% to 60%. In Indonesia, while efforts to lower the maternal mortality rate (MMR) primarily target pregnancy related risks, family planning has proven effective in decreasing MMR by reducing both the total number of pregnancies and the incidence of high-risk pregnancies.⁵ By 2023, increased contraceptive use was estimated to prevent approximately 77,400 maternal deaths worldwide, underscoring the critical and life-saving role of family planning alongside high-quality clinical services.⁸

The decision to use contraception either to space or to limit births is believed to be influenced by the level of understanding derived from exposure to or access to information about contraceptive methods.¹ Because contraception

use is an individual health issue, adequate information about family planning is necessary to establish a foundation for understanding. A key strategy in addressing family planning issues, particularly the promotion of family planning programs, is through Information education, and communication (IEC).¹²

The use of contraceptive methods is strongly influenced by the information received by Couples of Childbearing Age regarding family planning. Therefore, effective Communication, Information, and Education (IEC) serve as strategic and essential approaches to ensuring the success of family planning programs. Information, Education, and Communication can be accessed through various channels, including electronic mass media, print media, digital media, promotional media such as posters and leaflets, and face-to-face communication.¹ Several studies, predominantly conducted in African and Asian countries, generally show a positive relationship between media exposure and family planning information and contraceptive use.^{3,13} However, it is important to note that systematic literature reviews also concluded that some information channels were insignificant in influencing contraceptive use. This underscores the importance of specifically mapping the effectiveness of each communication channel across different contexts, particularly in light of the rapid growth of media platforms such as social media.

Although numerous studies have examined media exposure and contraceptive behavior in Indonesia, most rely on conventional regression methods (e.g. logistic regression) that cannot fully address selection bias, and therefore cannot accurately estimate the impact of information exposure on contraceptive use. In addition, earlier research has rarely incorporated family planning communication delivered directly by field officers as a separate explanatory variable, despite strong indications that interpersonal communication influences reproductive health decisions. No major study has simultaneously evaluated both media exposure and fieldworker communication using a Propensity Score Matching (PSM) framework, which enables a more robust causal assessment. Therefore, this study aims to fill these gaps by

using PSM to measure the causal impact of different media channels and family planning fieldworker communication on contraceptive use among Indonesian women of reproductive age, providing more accurate evidence for policy and program design.

Methods

This study used cross-sectional data from the 2017 Indonesian Demographic and Health Survey. Conducted every five years, the survey is part of the global DHS program and is implemented by the Central Bureau of Statistics in collaboration with the National Population and Family Planning Board and the Indonesian Ministry of Health. The survey employed rigorous data collection procedures. The study participants were married women aged 15–49 who participated in the 2017 survey and reported using either modern or traditional contraceptive methods. In total, data from 49,627 women of reproductive age were analyzed to ensure that the results accurately represent Indonesia's population across all 34 provinces.

The dependent or outcome variable in this study was the current use of contraceptives among married women aged 15–49. Contraceptive methods were classified into two categories, namely traditional and modern. Traditional methods included periodic abstinence, such as rhythm and calendar methods, withdrawal, and country-specific traditional practices considered effective, as well as folk or spiritual methods with unverified effectiveness, including herbal remedies, amulets, or charms. Modern contraceptive methods encompassed female and male sterilization, contraceptive pills, intrauterine devices, injections, implants, male and female condoms, diaphragms, the lactational amenorrhea method, the standard days method, emergency contraception, and other modern methods reported by respondents, such as cervical caps, contraceptive sponges, and similar options. The outcome variable includes both modern and traditional contraceptive methods, as defined in the IDHS. This combined measure is used to capture overall contraceptive behavior and to maintain consistency with the survey structure.

The main independent or treatment variable in this study was exposure to family planning information, defined as women of reproductive age who had heard or seen family planning messages through radio, television, newspapers or magazines, internet use, frequency of internet use, and interactions with family planning field workers. The frequency of reading newspapers or magazines, listening to the radio, and watching television was categorized into three groups: “never at all,” “less than once a week,” and “at least once a week.” Internet use was grouped into three categories, where “never” was coded as “No,” while “yes, in the last 12 months” and “yes, before the last 12 months” were coded as “Yes.” The frequency of internet use during the past month was divided into four levels: “not at all” was coded as “No,” while “less than once a week,” “at least once a week,” and “almost every day” were coded as “Yes.” Exposure to family planning communication through field officers was classified simply as “Yes” or “No”. It is important to note that the internet variables capture general internet use rather than specific exposure to family planning messages. As such, these variables may reflect access to a broad range of information sources, not all of which are directly related to family planning.

Potential covariates influencing the treatment group were identified through an extensive literature review on factors affecting access to family planning services and contraceptive use among women of reproductive age. The following variables were included in all models: age of the household head (≤ 29 , 30–39, 40–49, 50–59 ≥ 60 years), gender of the household head (male or female), wealth index (poorest to richest), type of residence (rural or urban), respondent’s age (15–19, 20–29, 30–39, 40–49), marital status (unmarried, married, divorced, or widowed), education level (no education, primary, secondary, or tertiary), employment status (employed or unemployed), and number of children (none, one, two, or three or more). Previous studies suggest that these factors are closely associated with variations in contraceptive use, exposure to family planning messages, or both. The analytical sample consists of married women aged 15–49 who have complete information on all variables

included in the analysis. Observations with missing values were excluded, which may result in differences compared to official DHS estimates. The outcome variable is defined as a binary indicator equal to 1 if the respondent is currently using any contraceptive method (modern or traditional), and 0 otherwise.

The analysis in this study was conducted using STATA with command “psmatch2” software version 17 to assess the influence of media exposure and family planning (FP) messages on contraceptive use among women aged 15–49. Ideally, experimental research is the best approach to measuring causal effects, as random sample allocation can minimize bias. However, this study used observational data, which poses a risk of bias due to imbalances in individual characteristics. To address this use a balancing score in order to match the treatment group and the control group.

This study employed the Propensity Score Matching method, following previous research by Dwomoh (2022). Propensity Score Matching was used to reduce selection bias and to create statistically comparable treatment groups, consisting of women exposed to media and family planning communication, and control groups, consisting of unexposed women. This approach strengthens the internal validity of the study and enhances the reliability of the estimated effects of media exposure on contraceptive use. In this study, the PSM procedure was implemented separately for each main independent variable, allowing the estimation of treatment effects for each type of information exposure individually. Radius matching was applied to replicate the randomization process by pairing participants with similar propensity scores based on the selected covariates. To improve the quality of matching in Propensity Score Matching (PSM), a caliper was applied, which defines the maximum permissible propensity score distance between treatment and control units. By limiting this distance, poor matching of pairs can be avoided, thereby increasing estimation accuracy, although the number of matched pairs may decrease and the estimation variance may increase..

In caliper matching, only individuals from the control group who fall within a certain

propensity score range and have the closest distance are selected as partners. The main challenge is the difficulty of determining the appropriate tolerance level before the analysis is conducted. In response to this limitation, Dehejia and Wahba (1999) developed radius matching, a method that includes all comparison units within the caliper radius, not just the closest pair¹⁵. This approach allows the use of more or fewer comparison units as available, thus maintaining the quality of the match without producing mismatched pairs.

The primary advantage of Propensity Score Matching (PSM) lies in its ability to minimize bias arising from non-random selection in observational studies by simulating the conditions and characteristics of randomized controlled trials.¹⁶ PSM has two important assumptions: selection on observables and common support. The first assumption states that the determination of who receives a treatment depends on observable characteristics. The second assumption commonly supports ensuring that individuals in the treatment group have an equivalent comparison partner in the control group¹⁶. Although fully fulfilling the first assumption is challenging, this study has examined its fulfillment. common support through joint support area testing and matching quality. Propensity scores were estimated using the `pscore` command in Stata, followed by the `psmatch2` procedure with logistic regression to calculate the Average Treatment Effect on the Treated.

The validity of the matching results was tested using the Rubin's B and Rubin's R balance criteria¹⁷. Rubin's B values of less than 25% and Rubin's R in the range of 0,5-2 indicate that the distribution of covariates has been balanced.¹⁸ Additional balance tests were performed on all control variables to ensure that the matching successfully eliminated significant differences between groups. Other tests were also conducted to test the validity of the data and the validity of the model used in this study such as conditional independence:

$$Y(0), Y(1) \perp\!\!\!\perp D | P(X), \forall X$$

A feasible identification strategy assumes that, conditional on a set of observable covariates X that are not affected by the treatment, the potential outcomes are

independent of treatment assignment. In addition to this independence assumption, a key requirement is the common support or overlap condition, which ensures that the probability of receiving the treatment is not perfectly determined by the covariates:

$$0 < P(D = 1|X) < 1$$

It guarantees that individuals with identical values of X have a non-zero likelihood of being assigned to either the treatment or control group. If the Conditional Independence Assumption (CIA) is satisfied and the overlap condition between the treatment and control groups also holds a combination referred to as strong ignorability by Rosenbaum and Rubin (1983) then the PSM estimator for the Average Treatment Effect on the Treated (ATT) can be expressed generally as follows.

$$\tau_{ATT}^{PSM} = E_{P(X)|D=1}\{E[Y(1)|D=1, P(X)] - E[Y(0)|D=0, P(X)]\}$$

In simple terms, the PSM estimator captures the average difference in outcomes within the region of common support, where each observation is weighted according to the propensity score distribution of the treated units. After outlining the general logic of the matching estimator within the broader evaluation framework, the next step involves detailing the specific procedures used to implement the PSM approach.¹⁷

After comparing several matching methods and diagnostic tests, including kernel matching and nearest-neighbor matching with and without replacement, this study selected the caliper radius technique with bandwidths ranging from 0,01 to 0,05 as the approach that yielded the best matching quality, this study use 0,01 caliper radius. When the underlying assumptions are satisfied, the Average Treatment Effect on the Treated can be estimated by calculating the difference in average outcomes between the matched treatment and control groups based on the propensity scores:

$$ATT = E[AND^T | D = 1, P(X)] - E[AND^T | D = 0, P(X)]$$

Where ATT is the effect representing Y , defined as contraceptive use in women of reproductive age estimated separately. T indicates participation exposed to media and family planning communication, while C represents the non-participant group (Control

group). $P(X)$ is the probability of contraceptive use based on the covariate vector X .

Result

Based on Table 1, a substantial share of reproductive -age women use contraception. Family planning information is predominantly obtained through television, while exposure via radio and newspapers is more limited, and direct interaction with family planning field workers remains low. Internet access and usage are at a moderate level, indicating the growing potential of digital media as an information channel.

Demographically, respondents are generally in their early reproductive years, mostly married, have education levels close to secondary schooling, live in households with moderate economic status, and show moderate labor force participation.

Table 1. Descriptive Statistics

Variables	Obs	Mean	Std. Dev	Min	Max
Contraceptive Use	49,627	0.4242046	0.4942266	0	1
FP_Radio	49,591	0.0865076	0.281115	0	1
FP_TV	49,610	0.5300746	0.4990997	0	1
FP_Newspaper/ Magazine	49,584	0.1217732	0.3270269	0	1
Fieldworker	49,610	0.0328361	0.1782093	0	1
Internet Use	49,615	0.5018644	0.5000016	0	1
Internet Frequency	49,600	0.4795161	0.4995853	0	1
Age of household head	49,625	46.55653	11.71533	15	98
Sex Household head	49,627	1.127955	0.3340425	1	2
Wealth Index	49,627	2.961916	1.441465	1	5
Residence	49,627	1.467528	0.4989495	1	2
Age	49,627	31.58456	10.08222	15	49
Marital Status	49,627	0.885123	0.7917135	0	5
Highest Education Level	49,627	1.900397	0.7027283	0	3
Currently Working	49,601	0.5385375	0.4985177	0	1
Number of Children	49,627	0.5665666	0.7250859	0	5

Two sample t-test is used to evaluate baseline characteristics (covariates) between treatment groups (treated) and the control group after the matching process is carried out. Scientifically, the main goal is to ensure that the difference in the average covariate between the two groups is no longer statistically significant, so that the assumption conditional independence can be more fulfilled.¹⁷

Table 2. Two Sample T-test

Variables	<i>p-value</i>
FP_Radio	0,9236
FP_TV	0,0000
FP_Newspaper/Magazine	0,0131
Fieldworker	0,0000
Internet Use	0,0000
Internet Frequency	0,0000

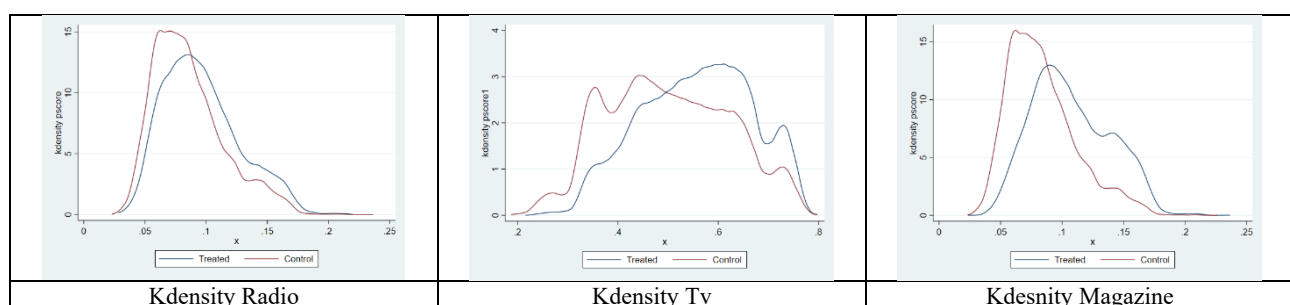
The two-sample t-test is used in this study to assess the balance of covariates between the treated and control groups, rather than to estimate treatment effects. Before matching, several variables show statistically significant differences, indicating initial imbalance between groups. After the matching procedure, these differences are substantially reduced, suggesting that the treated and control groups become more comparable in terms of observed characteristics. This improvement in balance supports the validity of the matching approach and the conditional independence assumption. However, given the sensitivity of p-values to large sample sizes, balance is also evaluated using standardized mean differences as well as Rubin's B and R statistics to ensure a more robust assessment of matching quality.

Tabel 3. Covariate Balance After Matching

Variabel	Mean Bias	Median Bias	Rubin B	Rubin R
Radio	2,7	1,8	9,3	1,09
Television	1,5	1,5	5,8	1,05
Newspaper	2,3	2,1	7,9	1,03
Field Worker	2,7	2,8	8,7	1,05
Internet Use	5,2	4,5	20,4	0,93
Internet Frequency	12,1	11,5	-12,3	0,97

Table 3 presents a summary of covariate balance after the matching procedure across all treatment variables. Overall, the results indicate a substantial improvement in balance, with mean bias values remaining below 10% for all specifications and Rubin's B and R statistics falling within the commonly accepted thresholds. This suggests that the matching process is generally effective in reducing observable differences between treated and

control groups. Among the different channels, television exposure shows the strongest balance performance, while internet use exhibits relatively higher residual imbalance, indicating a more complex selection mechanism. These findings support the validity of the matching approach, although the relatively weaker balance for internet-related variables should be interpreted with caution.



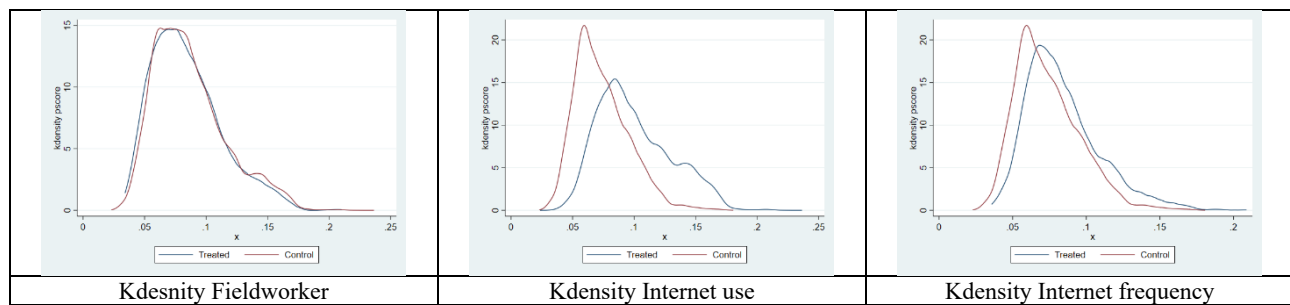


Figure 1 K density

Overall, the ATT results after matching all variables show differences in the impact of contraceptive use on women of reproductive age 15-49 years. This is presented in Table 4, which shows the estimation results. Treatment effect on the treated (ATT) based on six categories of media exposure and family planning communication through field workers on contraceptive use among women of reproductive age. The first variable, exposure to family planning programs on the radio, showed that in the unmatched sample, the level of contraceptive use among women of reproductive age in the treatment group (0,428) was slightly higher than in the control group (0,424), with a difference of 0,007; however, this difference was not statistically significant (t

$= 0,09$). After matching, the estimated effect became negative ($-0,015$) and remained statistically insignificant ($t = -1,38$), indicating that exposure to family planning programs on the radio did not significantly influence subsequent contraceptive use. Table 4 shows presents the number of observations included in the matching process for each treatment variable. The results show that all observations fall within the region of common support for most specifications, with no observations being dropped. This indicates a sufficient overlap between treated and control groups.

Tabel 4. Number of Matched Cases and Common Support Treatment

Variables	Treated (Matched)	Control (Matched)	Total (Matched)	Observations dropped
Radio	4,289	45,275	49,564	0
Television	26,287	23,296	49,583	0
Newspaper	6,034	43,523	49,557	0
Fieldworker	1,628	47,954	49,582	0
Internet Use	24,128	24,699	48,827	760
Internet Frequency	23,772	25,800	49,572	0

Table 5. PSM Result

Variables	Variables Sample	Treated	Control	Difference	S.E	T.stat	PSM Diagnostic
Fp_Radio	Unmatched	0.42480764	0.42407509	0.00073255	0.00789582	0.09	B: 9.3
	ATT	0.42480764	0.44042900	-0.0156213	0.01133500	-1.38	R: 1.09
Fp_Tv	Unmatched	0.44558146	0.39989697	0.04568448	0.00444233	10.28	B: 5.8
	ATT	0.44558146	0.40130102	0.04428044	0.00642074	6.90	R: 1.05
Fp_Magazine	Unmatched	0.40951276	0.42609654	-0.0165837	0.00678856	-2.44	B: 7.9
	ATT	0.40951276	0.40818694	0.00132582	0.01009725	0.13	R: 1.03
Fieldworker	Unmatched	0.60135135	0.41806731	0.18328403	0.01242757	14.75	B: 8.7
	ATT	0.60135135	0.52395577	0.07739557	0.01775085	4.36	R: 1.05
Internet Use	Unmatched	0.30685470	0.54228916	-0.2354344	0.00431107	-54.61	B: 20.6
	ATT	0.30685470	0.35611539	-0.0492606	0.01882712	-2.62	R: 1.00
Internet Frequency	Unmatched	0.30039542	0.53806201	-0.2376665	0.00431300	-55.10	B: 20.0
	ATT	0.30039542	0.33510011	-0.0347046	0.01800726	-1.93	R: 1.09

Table 6 Confidence Interval

Variables	95% CI
Radio	-0,0378, 0,0066
Tv	0,0318, 0,0568
Magazine	-0,0185, 0,0211
FieldWorker	0,0425, 0,1123
Internet Use	-0,0873, -0,0117
Internet Frequency	-0,1595, -0,0873

The second variable, namely the variable of hearing family planning programs from the television, shows that before matching the level of contraceptive use in reproductive age women (0,445) is higher than the control group (0,399), with a difference of (0,045). This difference is also statistically significant (10,28) because the t-statistic value is above the critical value ($t\text{-stat} > 2,58$) at a significance level of 1%, this shows that before matching women who hear family planning programs from TV have a higher probability of using contraception by 4,5% compared to those who do not. Then after matching, the difference coefficient becomes (0,044) and is significant at (6,90) at a significance level of 1%. This shows a consistent value, after matching, women who hear and watch family planning programs from TV have a higher probability of using contraception by 4,4% compared to those who do not.

The third variable, hearing about family planning programs in magazines or newspapers, showed that before matching, the contraceptive use rate among women of reproductive age (0,409) was lower than that of the control group (0,426) with a difference of -0,016. This result also showed statistical significance (-2,44) because the t-statistic value was above the critical value ($t\text{-stat} > 1,96$) at the 5% significance level. However, after matching, the difference coefficient became positive (0,001) and not statistically significant (0,13). This indicates that women who heard about family planning programs in magazines or newspapers in the past did not influence their decisions to use contraceptives in the future.

The fourth variable, namely hearing about family planning programs from family planning officers who visited respondents' homes, showed that before matching, the level of contraceptive

use among reproductive -age women (0,601) was higher than the control group (0,418) with a difference of (0,183). This result also showed statistical significance (14,75) because the t-statistic value was above the critical value ($t\text{-stat} > 2,58$) at a significance level of 1%. Then, after matching, the difference coefficient became (0,077) and consistently statistically significant at (4,36) at a significance level of 1%. These results indicate that reproductive age women who heard about family planning programs from family planning officers who visited their homes had a 7,7% higher probability of using contraceptives compared to those who did not.

The fifth variable, namely internet used by respondents, shows that before the matching, the level of contraceptive use in reproductive age women (0,306) was much lower than the control group (0,542) with a difference of (-0,235). This result also shows statistical significance (-54,61) because the critical value is ($t\text{-stat} > 2,58$) at a significance level of 1%. Then after matching in the treatment group and the control group, the difference coefficient becomes (-0,049) and the coefficient remains significant at a different number, namely at (-2,68) at a significance level of 1%. This result shows that every woman who uses the internet as a source of information will reduce her probability of using contraceptives by 4,9%. Internet use is associated with a lower probability of contraceptive use. However, this result should be interpreted with caution, as the variable reflects general internet access rather than direct exposure to family planning information.

Tabel 7. Robustness Check With Kernel Matching

Variables	Variables Sample	Treated	Control	Difference	S.E	Tstat
Fp_Radio	Unmatched	.424807647	.424075097	.000732551	.007895825	0,09
	ATT	.424807647	.420144344	.004663303	.007912316	0,59
Fp_TV	Unmatched	.445581466	.399896978	.045684488	.004442335	10,28
	ATT	.445581466	.391946845	.053634621	.004672257	11,48
Fp_Magazine	Unmatched	.409512761	.426096547	-.016583786	.00678856	-2,44
	ATT	.409512761	.404894172	.004618589	.007042827	0,66
Fieldworker	Unmatched	.601351351	.418067315	.183284037	.012427573	14,75
	ATT	.601351351	.440478165	.160873187	.012348889	13,03
Internet Use	Unmatched	.301972812	.542289162	-.20779086	.004084578	-50,87
	ATT	.301972812	.365704862	-.063732051	.012047934	-5,29
Internet Frequency	Unmatched	.311233886	.538062016	-.082536107	.001547	-53,35
	ATT	.311233886	.461589292	-.150355406	.012720485	-11,82

Tabel 7. Show robustness check, kernel matching was applied in addition to the main radius matching specification. The results remain consistent, indicating that the findings are not sensitive to the choice of matching method.

The final variable, namely frequency of internet use in the last six months by respondents, shows that before matching, the level of contraceptive use among women of reproductive age (0,300) was much lower than the control group (0,538) with a difference coefficient of -2,37. This result shows high statistical significance (-55,10) because the t-statistic value is above the critical value ($t\text{-stat} > 2,58$) at a significance level of 1%. Then after matching

between the treatment and control groups, the difference coefficient changed to -0,034 and the coefficient remained significant at a different number, namely at 1,93 with a significance level of 10%. This result indicates that every woman who uses the internet in the last six months as a source of information will reduce the probability of using contraceptives in the future by 3,4% compared to women who have not used the internet in the last six months.

Discussion

The results of this study found that exposure to family planning programs via radio did not have a statistically significant effect on contraceptive use among women of reproductive age in the future. This was also the case in several previous studies, such as that by Wulandari (2023), which stated that the frequency of radio listening did not have a significant effect on contraceptive use.² Similarly, research on 2012 SDKI data showed that the odds ratio between women who received family planning information from the radio compared to those who did not receive it was not significantly related to contraceptive use¹². Radio use may not directly influence contraceptive use but only as a medium for family planning messages, and may be influenced by other factors.¹⁴ This is because the

effectiveness of media and communication, information, and education is largely determined by the number of senses involved in receiving the message: the more senses used, the easier the communication message can be understood.¹² Radio, as an audio medium, relies solely on the sense of hearing and is less able to provide clear visualizations or images.

Television has been shown to significantly increase the likelihood of contraceptive use among women of productive age in Indonesia. Television has a significant positive effect, with women who frequently watch television being 1,737 times more likely to use contraception than those who don't.² Research in Nigeria found that adolescents with access to television were nearly three times more likely to use modern contraception.¹⁹ Television's powerful impact stems from its audiovisual nature, offering benefits such as visualization,

attractiveness, wider audience reach, and the ability to broadcast repeatedly.¹ Therefore, television's impact is more effective in increasing knowledge and influencing women's fertility behavior. Furthermore, exposure to family planning information on television has been shown to stimulate wives to discuss family planning issues with their husbands.²⁰

Exposure to family planning program information through magazines or newspapers (print media) tends to be insignificant in influencing future contraceptive use decisions among women of productive age, and this is supported by various literature. Although family planning information significantly influences contraceptive use, print media information channels have not been shown to significantly increase its use.²¹ Studies from West Africa and Sierra Leone found that printed family planning information had almost no effect on the use of modern contraceptive methods among adolescents.²² These insignificant results occur for several reasons: first, access to print media in Indonesia is relatively low.²³ Print media also tends to be consumed by certain segments of society who are already reduced or at higher levels of wealth and urban areas, making it less able to reach all levels of society. Second, print media is less effective than audio-visual media such as television because it relies solely on the sense of sight and lacks the visual and attractive power that can change behavior massively.¹²

Exposure to family planning programs from family planning field officers (PLKB/Family Planning Field Officers/FOFP) significantly increases the probability of contraceptive use, a finding strongly supported by numerous studies in Indonesia and globally, highlighting the highest effectiveness of interpersonal communication and direct counseling. Various analyses have shown that family planning officers and medical personnel play a crucial role and significantly influence contraceptive use. Women who receive information from family planning officers are 1,4 times more likely to use contraception, and those who do not receive information from medical personnel are 2,2 times more likely to use contraception than those who do not.¹² This effectiveness occurs because face-to-face communication or home visits allow officers to implement a

targeted, persuasive approach and provide adequate communication, information, and education (IEC) and counselling.^{24,4} This direct (door-to-door) approach allows Family Planning fieldworkers to directly understand field conditions and the characteristics of Fertile Age Couples (PUS), address complaints, provide solutions, and ensure that acceptors make contraceptive choices based on complete and accurate knowledge.

Women who access family planning (FP) information via the internet have a significantly lower probability of using contraception, these results differ from the results of research by Ubale (2025) which found that teenager who are exposed to cell phones and the internet are more likely to have premarital sex and use condoms during their first sexual intercourse.²⁵ However, the findings of this study are also supported by several studies analyzing the impact of digital media in Indonesia and other developing countries, and this phenomenon is primarily due to issues with information quality and validation. A study examining modern contraceptive use in western Indonesia found that married women who obtained family planning information through the internet were significantly less likely to use modern contraceptives compared with those who were not exposed to such information.²⁶ In Indonesia, logistic regression analysis similarly indicated that internet use in the past 6–12 months was associated with a reduced likelihood of modern contraceptive use.² This decrease in the probability of contraceptive use after internet exposure could occur for several reasons: the internet provides a large amount of information, but its validation is not systematic, allowing anyone to share unfiltered information, which can lead to misinformation about contraception.²⁷ This is also possible because internet users have read unverified information about the side effects of modern contraceptives and other alternative methods, which then makes them reluctant to use contraception.²⁸ The negative association between internet use and internet frequency to contraceptive use should be interpreted carefully. Unlike other variables in this study, the internet measure does not specifically capture exposure to family planning messages, but rather general access to

digital information. As a result, this variable may reflect exposure to a wide range of content, including misinformation, conflicting health narratives, or non-health-related information. This complexity makes it difficult to attribute the observed effect directly to family planning communication. Therefore, the findings likely capture broader digital information environments rather than a direct causal effect of internet-based family planning messaging.

A limitation of this study is the use of data from the 2017 Indonesia Demographic and Health Survey. Since then, internet access and smartphone penetration in Indonesia have increased substantially, potentially changing patterns of information exposure, especially through digital platforms. As a result, the relationship between internet use and frequency internet to contraceptive behavior observed in this study may not fully reflect current conditions. More recent data suggest that contraceptive prevalence rates remain relatively stable, but the channels through which information is accessed are likely evolving. Future research should incorporate newer datasets to better capture these dynamics.

Conclusions

This study finds that the effectiveness of family planning communication in Indonesia differs markedly across media channels. Television exposure and interpersonal communication through family planning field officers significantly increase contraceptive use, while radio and print media show no clear effect, and internet-based information is associated with lower contraceptive adoption, potentially due to misinformation and weak content credibility. These results highlight the importance of message quality, delivery modality, and trusted sources in shaping reproductive health behavior. Accordingly, policy efforts should prioritize television campaigns, strengthen and expand the role of family planning field officers, improve digital health literacy and oversight of online information, and redesign radio and print strategies to better reach vulnerable groups. Overall, strengthening credible and effective communication channels is essential to improving informed contraceptive choices and

reproductive health outcomes in Indonesia.

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