Empowering Women to Promote Prostate Cancer Screening: Effects of Message Framing in Brochures

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Abstract

Background: Prostate cancer is a leading cause of cancer mortality among men globally as well as in Kenya. Successful detection, treatment, and management of prostate cancer are dependent on emotional, social, physical, and financial support. Female partners have been shown to motivate, counsel, and enhance their self-esteem. Therefore, the present study aimed to assess the effect of gain-framed and loss-framed brochure interventions on knowledge and recommendations for prostate cancer screening among female partners.

Material and Methods: The study adopted a randomized controlled trial design, whereby the control and the two intervention sites were randomly selected from a sampling frame of the sub-counties in Kiambu County. At the control and intervention sites, female partners of men above the age of 40 years who were the study participants were randomly selected. Intervention involved the use of gain-framed and loss-framed brochures. The sample size was determined using Magnani formulae, and 279 respondents from the control and intervention sites were recruited into the study. The chi-square test was used to assess differences in recommendations for prostate cancer screening, general knowledge of prostate cancer, knowledge of signs of prostate cancer (PC), and prostate cancer screening (PCS) methods between the control and intervention groups at baseline and end line. Further, data were subjected to structural equation modeling to assess the influence of knowledge on recommendations for prostate cancer screening.

Results: there was a significant difference in female partner recommendations for prostate cancer screening among male partners in the control and intervention groups ($\chi 2$ =14.591, p= 0.001). Both intervention groups (gain- and loss-framed) had dramatically higher recommendation rates compared to the control group. The difference between gain-framed (93.4%) and loss-framed (91.2%) was relatively small, and the two approaches were highly effective, nearly doubling the recommendation rate compared with the control group. The gain- and loss-framed brochure intervention significantly improved general knowledge on PC, knowledge of PC signs, and knowledge of PCS compared to the control group. Improvements from zero baseline knowledge of PC screening methods are particularly noteworthy. Gain-framed messaging was most effective for general knowledge of PCS methods, which increased by 63% and 31.9%, respectively, while loss-framed messaging was more effective in increasing knowledge of PC signs by 27.4%.

Conclusion: The study therefore recommends the need for partners in health to ensure provision of hybrid educational materials using both gain- and loss-framed approaches in healthcare settings, as well as ensuring education for both female and male about prostate cancer.

Key words: Prostate Cancer Screening, Brochure Intervention, Female Partners, Gain-framed messages, Loss-framed messages, Health Advocacy

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Introduction

Globally, prostate cancer is the fourth most common cancer and second most common cancer in men. In 2022, 1,467,854 new cases of prostate cancer were reported in the USA, China, and Japan, accounting for the highest number of cases (World Cancer Research Fund, 2025). Prostate cancer is the most common non-skin cancer among men, accounting for 3.8% of all cancer-related mortality in men (Bray et al., 2018; James et al., 2017). Evidence indicates that Prostate cancer is the fifth leading cause of cancer-related deaths among men worldwide (Sung et al., 2021). It is also projected that the burden of prostate cancer will increase due to an increase in the aging population and economic growth, which has an impact on risk factors (Culp et al., 2020). Evidence suggests that African men are disproportionately affected by prostate cancer. In sub-Saharan Africa, PC is the leading cause of cancer deaths among men (Bray et al., 2018; Odedina et al., 2009). In Kenya, PC is the most prevalent cancer among men and the third leading cause of cancer-related mortality after breast and cervical uterine cancer (WHO, 2024).

Partners can serve as a source of motivation for their mates to change their behavior and provide emotional, social, and physical support (Bergner et al., 2018; Lewis et al., 2006). Evidence shows that female partners play a key role in enhancing positive health behaviors in their male partners, such as healthy eating and health-seeking behavior (Manne et al., 2012). Female partners considerably influence men's decision-making regarding prostate cancer, since they serve as a source of information and support their partners to integrate and utilize prostate cancer information (Arrington et al., 2005; Friedman et al., 2009). Studies have indicated that female partners are important confidants to whom men express their fears, struggles, and concerns, particularly those related to health (Helgeson et al., 2004; Lewis et al., 2004). Further evidence indicates that female partners empower their sick

husbands when diagnosed with PC to regain sense control and compliment their coping strategies (Maliski et al., 2001).

Evidence suggests that women have little information about prostate cancer screening guidelines, potential harm, or limitations (Wiafe et al., 2021). However, women are eager to learn and are efficient in disseminating health information to their partners, and hence, influence their male partners' decision-making. A US study documented that female partners desired to know more about the controversies surrounding PCS tests (Allen et al., 2018). This is primarily because they understand that PCS is associated with a long and healthy life. Evidence suggests that equipping women with knowledge of PC may significantly contribute to the early detection of PC. Thus, the present study aimed to assess the effectiveness of using gain-framed and loss-framed brochures to impact knowledge of prostate cancer in women, with the view that they are message carriers to their male partners.

Material and Methods

Study site

This study was conducted in Kiambu County. The county is located in the central region and spans a total area of 2543.5 km2, of which 476.3 km2 is covered in forest. The county is bordered by Nairobi, Kajiado, and Machakos to the south, Muranga to the east, Nyandarua to the northwest, and Nakuru to the west of Kiambu County. According to the KNBS (2019a), Kiambu County is located between longitudes 360 and 370 and latitudes 00, 25, 10, and 20 south of the equator. According to the 2019 census, the population of Kiambu County is approximately 2,417,735, with 1,187,146 males, 1,230,454 females, and 135 intersex persons. The region, which is located between 1500 and 1800 m above sea level, is primarily a tea and dairy zone, although some other activities such as the farming of maize, fruits and vegetables, and sheep are also carried out there (KNBS, 2019).

Study design

This study adopted a randomized controlled trial study design. To carry out the study, study sites were randomly selected within Kiambu County, where one sub-county was the control site and two other sub-counties were the intervention sites. In the control and intervention sites, female partners of men aged > 40 years who had resided in Kiambu County for a minimum period of six months were randomly selected. In this study, participants at the intervention site received a series of interventions. Intervention involved the use of gain-framed and loss-framed brochures. Specifically, the female partners of the study participants received gain-framed and loss-framed bronchures with health information on prostate cancer, while the female partners of study participants in the control group received brochures on a different health topic.

Experimental procedure

A total of 279 samples from the control and intervention sites were computed using the Magnani formula. Random cluster sampling was used to identify study participants at all sites. The data were collected using structured questionnaires. The research tool was presented in Nakuru County, Japan. Validity was also ensured by ensuring randomization during sampling, matching study participants according to socio-demographic characteristics at all sites, and expert validation of the research tool by a prostate cancer expert.

Statistical analysis

The chi-square test was used to determine the differences in perception, attitude, and cultural beliefs regarding prostate cancer screening between participants in the control and intervention groups pre- and post-intervention. Furthermore, structural equation modelling was performed to measure the influence of perception, attitude, and cultural beliefs on intention to undergo prostate cancer screening at baseline and endline.

Ethical consideration

Ethical clearance for the study was sought from the MKU Institutional and Ethical Review Committee (IERC) and the National Commission for Science, Technology, and Innovation (NACOSTI). Permission was sought from the Kiambu County Director of Health. Consent was obtained from the study participants.

Results

At the baseline and end line, there was a significant difference in the level of education between the control and intervention groups ($p<0.05$). The majority of respondents in the control and intervention groups, both at baseline and end line, had secondary school education, while the least had no formal education. There were no significant differences in age, religion, and occupation between the control and intervention groups at baseline and end line. At baseline the mean age in the control, in the group intervened using gain framed and loss framed brochures was 45.51, 45.39 and 45.56 years respectively. At end line the mean age in the control, in the group intervened using gain framed and loss framed brochures was 45.62, 45.58 and 45.68 years respectively. All respondents in the control and intervention groups at baseline and the end line were Christian. Regarding occupation, the majority of respondents in the control and intervention groups at baseline and end line were self-employed, while the least were employed. With regard to monthly income, the mean income in the control group and the group treated using gain-framed and loss-framed brochures at baseline was Ksh.15494.62, ksh.14367.74, and ksh.15247.31, respectively. At end line the mean income in the control group, group intervened using gain framed and loss framed brochures at baseline was ksh.15175.82, ksh.14456.04 and ksh.15208.79 respectively (table 1).

Table 1: socio demographic characteristics of the respondents

	Baseline					Endline				
Variable	Control	Gain framed	Loss framed	χ2	P value	Control	Gain framed	Loss framed	χ2	P value
	f(%)	f(%)	f(%)			f(%)	f(%)	f(%)		
Age										
Mean	45.51	45.39	45.56			45.62	45.58	45.68		
Standard deviation	8.97	8.82	8.95			9.00	8.77	9.00		
P value	0.991					0.997				
Level of education										
No formal education	3(3.2)	3(3.2)	4(4.3)	14.665	0.023	3(3.3)	3(3.3)	4(4.4)	15.024	0.020
Primary	17(18.3)	37(39.8)	28(30.1)			16(17.6)	36(39.6)	28(30.8)		
Secondary	58(62.4)	49(52.7)	51(54.8)			57(62.6)	48(52.7)	49(53.8)		
Tertiary	15(16.1)	4(4.3)	10(10.8)			15(16.5)	4(4.4)	10(11.0)		
Religion										
Christians	93(100)	93(100)	93(100)			91(100)	91(100)	91(100)		
Occupation										
Unemployed	15(16.1)	16)17.2)	18(19.4)	1.412	0.842	14(15.4)	16(17.6)	18(19.8)	1.700	0.791
Self employed	68(73.1)	71(76.3)	67(72.0)			67(73.6)	69(75.8)	66(72.5)		
Employed	10(10.8)	6(6.5)	8(8.6)			10(11.0)	6(6.6)	7(7.7)		
Monthly income (Ksh)										
Mean	15494.62	14367.74	15247.31			15175.82	14456.04	15208.79		
Standard deviation	12435.16	12443.77	14330.08			12016.74	12554.91	14479.12		
P value	0.827					0.908				

Recommendation for prostate cancer screening

At baseline, there was no significant difference in female partner recommendations for prostate cancer screening between male partners in the control and intervention groups (χ2 =0.387, p= 0.824). Finally, there was a significant difference in female partner recommendations for prostate cancer screening among male partners in the control and intervention groups (χ2 =14.591, p= 0.001). Close to all (93.4%) female partners in the group intervened using gain-framed brochures would recommend prostate cancer screening to their male partners, 91.2% of female partners in the group treated using loss-framed brochures would recommend PCS, while in the control group, 52.7% of the female partners would recommend PCS (figure 1).

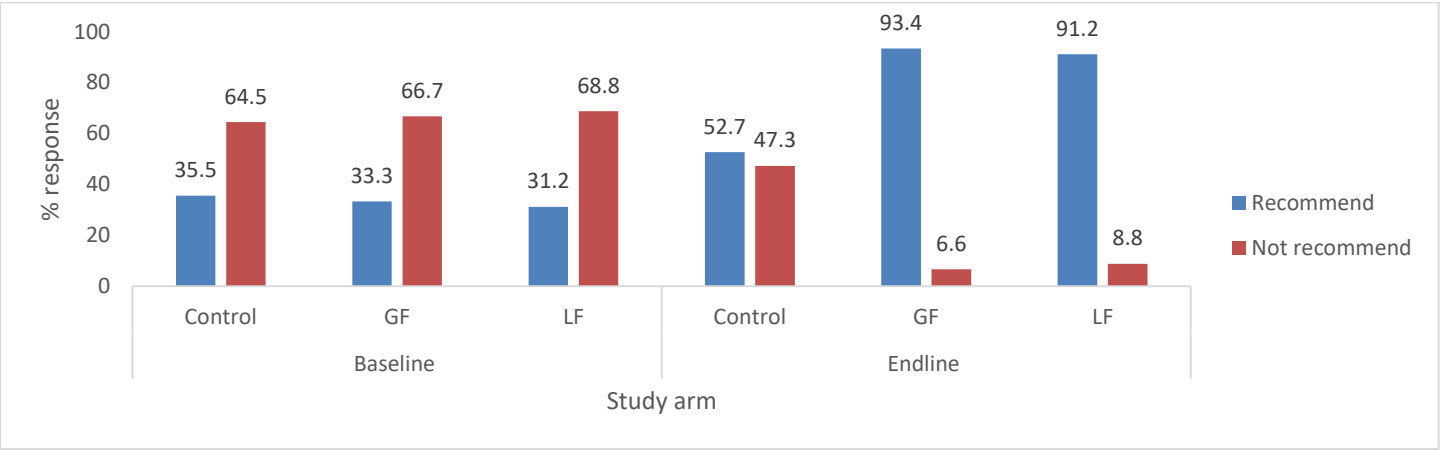

Figure 1: Recommendation for prostate cancer screening in control and intervention groups at baseline and end line.

Knowledge on prostate cancer

At baseline, there was no significant difference in the general knowledge of prostate cancer among female partners in the control and intervention groups, while at the end, there was a significant difference ($p<0.05$). At the end, female partners who had the highest general knowledge on prostate cancer were those in the gain-framed brochure group (81.3%), followed by those in the loss-framed brochure group (74.7%), while the least was in the control group (49.5%). Knowledge of prostate cancer screening methods differed significantly among respondents in the control and intervention groups ($P<0.05$). Female partners who had the highest knowledge on signs of prostate cancer were those in the group intervened using loss-framed brochures (63.7%), followed by those in the group treated with gain-framed brochures (61.5%), while the least was in the control group (7.7%). At baseline, there was no significant difference in knowledge of prostate cancer screening methods between the control and intervention groups, but at the end, there was a significant difference ($p<0.05$). At baseline, none of the female partners in either the control or intervention groups had any knowledge of PC screening methods. At the end of the study, female partners who had the highest knowledge of prostate cancer screening methods were in the group that used the gain-framed brochure method (31.9%), followed by those in the group that used the loss-framed brochure method (25.3%), while the least was in the control group (5.5%) (Table 2).

Table 2: General knowledge, knowledge on PC signs and knowledge on PCS among female partners at baseline and endline.

	Baseline					Endline				
Variable	Control	Gain framed	Loss framed	$\chi2$	P value	Control	Gain framed	Loss framed	$\chi2$	P value
	f (%)	f (%)	f (%)			f (%)	f (%)	f (%)		
General knowledge on prostate cancer										
Knowledgeable	35(37.6)	32(34.4)	33(35.5)	0.218	0.897	45(49.5)	74(81.3)	68(74.7)	23.868	<0.001
Not knowledgeable	58(62.4)	61(65.6)	60(64.5)			46(50.5)	17(18.3)	23(25.3)		
Knowledge on signs of prostate cancer										
Knowledgeable	4(4.3)	2(2.2)	6(6.5)	2.090	0.352	7(7.7)	56(61.5)	58(63.7)	74.306	<0.001
Not knowledgeable	89(95.3)	91(97.8)	87(93.5)			84(92.3)	35(38.5)	33(36.3)		
Knowledge on PC screening methods										
Knowledgeable	0(0)	0(0)	0(0)			5(5.5)	29(31.9)	23(25.3)	20.754	<0.001
Not knowledgeable	93(100)	93(100)	93(100)			86(94.5)	62(68.1)	68(74.7)		

At baseline, general knowledge of prostate cancer, knowledge of signs of prostate cancer, and knowledge of PC screening methods had no influence on female partners' recommendation for prostate cancer screening among their male partners in the control and intervention groups (Table 3).

Table 3: Direct relationship between independent and dependent variable at baseline

	Control			GF			LF		
	β	SE	P value	β	SE	P value	β	SE	P value
General knowledge> recommendation for PCS	0.115	0.059	0.052	0.124	0.078	0.063	0.149	0.043	0.087
Knowledge on signs> recommendation for PCS	0.144	0.140	0.302	0.264	0.132	0.438	0.158	0.136	0.651
Knowledge on PC screening methods> recommendation for PCS	0	0	0	0.004	0.0002	0.765	0.003	0.0001	0.987

Finally, general knowledge on prostate cancer and knowledge on prostate cancer screening had a significant influence on female partner recommendation for PCS in the group that underwent the gain-framed brochure method (β = 3.236, p = 0.035, β = 22.246, p <0.001). Additionally, knowledge of the signs of prostate cancer and prostate cancer screening methods had a significant influence on female partner recommendation for PCS in the group that underwent the loss-framed brochure method (β = 5.758, p = 0.002; β = 11.127, p <0.001) (Table 4).

Table 4: Direct relationship between independent and dependent variable at end line

	Control			GF			LF		
	β	SE	P value	β	SE	P value	β	SE	P value
General knowledge> recommendation for PCS	1.456	1.800	0.835	3.236	1.022	0.035	0.327	0.955	0.242
Knowledge on signs> recommendation for PCS	0.575	1.360	0.684	0.890	0.907	0.898	5.758	0.912	0.002
Knowledge on PC screening methods> recommendation for PCS	0.817	1.142	0.860	22.246	0.747	<0.001	11.127	1.654	<0.001

Discussion

Recommendation for Prostate Cancer Screening (PCS)

Evidence suggests that the efficacy of print messages aimed at promoting behavior change is influenced by the framing of the messages (Hischey et al., 2017). The study revealed that at the endline, there was a significant increase in the number of female partners who would recommend prostate cancer screening to their male partners. Specifically, female partners exposed to gain-framed brochures showed the highest recommendation rate (93.4%), followed closely by those who received loss-framed brochures at 91.2%, while only 52.7% of female partners in the control group recommended PCS to their male partners, demonstrating the effectiveness of both framing approaches in influencing health communication within partnerships. Both gain- and loss-framed messages proved highly effective compared to the control, suggesting that structured health communication materials can significantly influence health advocacy behaviors. Similarly, a meta-analysis has documented that gain-framed interventions are more likely to promote preventative behavior, such as recommendations for screening and adopting positive lifestyle factors (Gallagher & Updegraff, 2012). Furthermore, a meta-analysis concluded that both gain-framed and loss-framed messaging have a similar positive effect on behavior change and, in this context, recommendations for PCS (O'Keefe & Jensen, 2009). Evidence suggests that women are eager information seekers and can disseminate the same education to their male partners, and consequently recommend and encourage them to make informed decisions, such as prostate cancer screening (Allen et al., 2018). Further, according to a US study, women are normally ready to provide emotional support to their partners to undergo PCS as well as annual checkups, since they associate this with living a long and healthy life (Allen et al., 2018).

Knowledge on prostate cancer

Evidence suggests that there is generally a considerably high knowledge gap regarding prostate cancer among patients as well as the general public (Wiafe et al., 2020). A US study has documented that women lack knowledge of prostate cancer and are willing to learn more about PC so that they can support their partners in undergoing PCS (Allen et al., 2018). The study results revealed that post-intervention gain-framed brochures were the most effective in improving general prostate cancer knowledge (81.3%) and awareness of screening methods (31.9%), whereas loss-framed brochures were particularly effective in increasing knowledge of prostate cancer signs (63.7%). The study findings suggest that positive messaging, which focuses on the advantages of early detection and prevention, resonates strongly when conveying general information and practical screening procedures. However, when it came to recognizing signs of prostate cancer, loss-framed messages, which typically highlight the risks of not taking action, were more effective, with 63.7% of the participants showing improved knowledge. This aligns with psychological research suggesting that people may be more attentive to potential health threats when learning about disease symptoms, making loss-framed messages particularly impactful in this specific aspect of health education. Further consistency with prospect theory, gains framed messaging has been documented to have a profound positive effect on preventive behavior, which is informed by increased knowledge on benefits adoption of the behavior (Latimer et al., 2010). A Kenyan study reported that both gain-framed and loss-framed brochure interventions resulted in a significant increase in men's knowledge about prostate cancer (Kimani et al., 2024).

The study findings indicate that in the group treated using a gain-framed brochure, general knowledge and knowledge of prostate cancer screening were determinants of female partner recommendation for PCS, while in the loss-framed group, knowledge of risk factors and PC screening methods were key determinants. This implies that when women understand the disease and screening methods in a benefit-focused context, they become more likely to advocate for screening. Furthermore, the consistently strong effect of screening-related knowledge across both framing approaches underscores its importance in empowering female partners as health advocates, regardless of how information is presented

(Singh et al., 2017). Similarly, A US study recommended the need to actively involve women in PC detection through health education on the disease, its symptoms, and detection methods (Blanchard et al., 2005). Evidence suggests that women play a significant role in the early detection of PC, and studies have shown that women can observe symptoms presented by their partners, thus pushing them to seek medical attention (Madjar et al., 2007; Owens et al., 2017).

Conclusion

The study findings demonstrate the significant impact of educational interventions using both gain- and loss-framed messaging strategies on female partners' knowledge and advocacy for prostate cancer screening (PCS). While baseline measurements showed no significant differences between the control and intervention groups, the endline results revealed marked improvements in both knowledge and screening recommendations among intervention groups. The gain-framed approach proved particularly effective, with 93.4% of female partners recommending PCS and demonstrating the highest levels of general knowledge (81.3%) and screening awareness (31.9%). Although both framing strategies were effective, they influenced different aspects of knowledge acquisition and advocacy behavior. The gain-framed messages significantly influenced screening recommendations through general knowledge and screening awareness, whereas loss-framed messages worked through knowledge of cancer signs and screening methods. These findings underscore the effectiveness of educational interventions in empowering female partners as health advocates and suggest that a combination of framing strategies might be optimal for comprehensive prostate cancer education and screening promotion programs.

Acknowledgments

The author express their gratitude to the research participants for their enthusiastic participation.

Competing Interests

The author declares that there is no conflict of interest.

Availability of Data Statement

The corresponding author can provide the datasets used and/or analyzed in the current study upon reasonable request.

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