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“False Alarm” Mammography Results—How Do Women React?

Editor’s note: Most preventive care guidelines recommend that women aged 40 and older receive a mammogram every 1-2 years to screen for breast cancer. While much research has focused on the factors that influence a woman’s decision to obtain a mammogram, less is known about the factors that influence a woman to return for subsequent mammograms at regular intervals. The vast majority of positive mammograms turn out to be false alarms—meaning that further testing reveals that the woman does not have breast cancer. This Issue Brief summarizes work by marketing scientists that explores the psychological effects of false-positive mammograms, and the potential impact on a woman’s willingness to be retested in the future.

False-positives are common in mammography

Similar to other cancer screening tests, about 80%-90% of abnormal screening mammograms are false-positives. That means that the results are suspicious enough to prompt followup testing or breast biopsy, but do not turn out to be cancer in the end. In the meantime, these false-positive results can cause anxiety, inconvenience, discomfort, and additional medical expenses.

- About half of all women will have at least one false-positive mammogram after a decade of annual screening, and nearly 19% will have a surgical biopsy associated with a false-positive mammogram.
- When a screening test indicates that the disease is present when it is not, the immediate psychological cost of a “temporary diagnosis” is tempered by the later relief when the positive result turns out to be false. This psychological ‘roller coaster’ is likely to be emotionally stressful, particularly when the diagnosis has such serious consequences.
- The anxiety caused by a false-positive experience may deter women from obtaining subsequent screening, by decreasing their confidence in the test. Alternately, the false-positive experience may increase a women’s feelings of vulnerability to breast cancer, leading to a greater willingness to continue mammography screening. Since preventive screening is most successful if women get mammograms regularly, understanding and managing this testing experience is important.

Studies simulate false-positive scenarios

Kahn and Luce conducted three studies to explore the psychological effects of false-positive test results. The study samples included women in a university hospital mammography waiting room. None of the women had been diagnosed with breast cancer and most were waiting for routine, screening mammograms.

- For the experiments, patients were asked to imagine that they had just undergone a test and were about to receive their results. Some women were told to imagine an initial test result suggesting the possibility of breast cancer, but negated by a second, more accurate,

test. Others were told to imagine a normal initial test confirmed by a second, more accurate, test. Research assistants handed each woman an envelope with results to make the simulation more realistic.

- These experimental methods approximate the experience of a real-world false-positive. For instance, a real-world “cancer scare” often involves a patient being informed by a doctor about a troubling test result, and thinking about the implications of that result while awaiting further testing that will ultimately reveal that the initial result was an error.
- The authors tested whether a false-positive experience (even a simulated one) was associated with changes in how women perceived the accuracy of the test, the stress related to the test and to breast cancer, the potential harm of a false-positive result, and intentions for future testing.

Effect of false-positives depends on how serious the consequences are

In the first study, Kahn and Luce compared the reactions and perceptions of women in the context of a “high-stakes” test (mammography) versus a lower-consequence context (in this case, they described a skin-density test that would predict wrinkling). All 64 women in the study were asked to evaluate the potential harm from a false-positive result, whether or not they had received one in the simulation.

- Women who had received a false-positive simulated result attributed greater harm to high-consequence false alarms (e.g., mammography) than to low-consequence (e.g., wrinkle prediction) false alarms. However, this relationship did not exist (and was reversed) for women who received normal simulated results. These effects occurred even though all participants were told at the end of the study that they had received a normal test result.
- Across both contexts, women receiving false-positive results believed the false positive rate of the test was higher than did participants receiving normal results.
- This pattern of results helps reconcile earlier work showing false-positive results can increase willingness to be retested, apparently by increasing vulnerability, in lower-stakes environments. Perhaps when the consequences are mild enough, the false-positive experience seems less harmful because the consumer realizes that a positive diagnosis is nothing to fear.
- However, these findings also suggest that false-positive results might decrease intentions for future testing in high-stakes decisions. This finding was tested further in the second study, by assessing plans to return for mammograms in the future.

False alarms decrease intentions to get scheduled mammograms

In the second study, Kahn and Luce focused solely on mammography, and added one other scenario to their simulations. In addition to imagining normal and false-positive mammography results, some women were asked to imagine a positive mammogram result followed by a more accurate test that showed changes in breast tissue, which increased their risk of developing breast cancer in the future. Ninety-seven women completed this study.

- Patients in the false alarm and increased risk groups experienced more stress about the test and were less likely to believe that a positive mammography result indicated cancer than patients receiving normal results.
 - Patients in the false alarm group showed lower intentions to get retested at regular intervals than patients in the other two groups.
 - Although patients in the increased risk group showed increased test stress and decreased confidence in the test, their plans for retesting did not differ from the normal result group. This finding may indicate that their perceptions that the test was less accurate than previously thought offset their increased sense of vulnerability to breast cancer.
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Coping information reduces the detrimental effects of false-positives

Within the second study, the authors tested the value of providing coping information to patients after they received their initial test results. Patients were exposed to one of three kinds of information: a brief description of mammograms (control group); an explanation of the efficacy of breast self-exams, emphasizing the patient's role in the screening process and providing an outlet for a woman to exercise some control; and text that emphasized that a positive mammography result is not definitive, highlighting the fact that mammography is only a first step in the screening process.

- For women receiving false alarm results, both kinds of coping information decreased the levels of stress they experienced about the test results compared to the information control group, and increased their willingness to be retested at regular intervals.
- Women who received normal test results or results indicating an increased risk for breast cancer did not respond to coping information; that is, neither their test stress nor plans for retesting changed compared to women in the information control group.
- Thus, information interventions designed to facilitate coping might reverse the detrimental effects of false-positives on planned adherence to a regular mammography schedule.

Effects of multiple false-positive mammograms may be cumulative

In the third study, the authors examined how the presence of an actual false-positive medical history may affect reactions to subsequent false-positives. After measuring baseline stress about breast cancer and prior false-positive history, 75 study participants were asked to imagine false alarm test results. As in the second study, the participants were exposed to coping information after the initial positive result. Of the 75 patients, 32 reported a previous false alarm experience.

- Prior false-positive history alone was not associated with differences in the intention to be retested after the simulation. However, prior history was associated with different reactions to stress about breast cancer and to coping information.
- Given a prior false-positive history, baseline stress decreased intentions to get retested, while the relationship was reversed in the absence of false-positive history.
- Consistent with the finding that stress is more troubling for the false-positive history group, coping information improved plans to be retested only in that group.
- This analysis suggests that false-positive effects may accumulate over time, with prior false-positive results causing women to be most vulnerable to the negative effects of later false-positives.

POLICY IMPLICATIONS

Screening tests have psychological, clinical, and economic costs, and these costs are often hard to anticipate. These studies indicate that false-positive mammography results have a moderating impact on plans to return for testing at regular intervals. Thus, in contexts where repeated false-positives are likely, policy makers should ensure that patients are given tools to deal with test- and disease-related stress.

- These studies used information interventions that could easily be provided in waiting rooms. These types of information can help women cope with the stress that they are experiencing. Such information might be tailored to the stage of testing, in particular to whether a woman has had a prior false-positive result. This might have some of the advantages associated with individual tailoring of mammography-related messages but at relatively low implementation costs.
- Further research is needed on the effects of cumulative false-positive history. Repeated false-positive experiences are not uncommon in mammography, and so these relationships might have important long-term effects. A longitudinal approach could also be used, for example, to measure over-time implications for women with a false alarm history.

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POLICY IMPLICATIONS

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- These results are likely to generalize to any stressful testing situation, where screening must be done on a regular basis without the prior presence of symptoms as a motivator. The implications for other cancer screening programs should be considered.
- Recent research on actual mammography adherence is encouraging. A study using a state-based registry found that women with a false-positive mammogram were more likely to return for screening at 18 and 30 months than women with true-negative results. It is possible that health professionals are providing patients with the appropriate information to mitigate some of the emotional reactions identified in Kahn and Luce's experimental work. These emotions, such as stress and perceived test accuracy, can have lasting effects on women's quality of life and longer-term adherence. As such, it remains important for health professionals to address these concerns and to communicate appropriately with patients.

This Issue Brief is based on the following article: B.E. Kahn, M.F. Luce. Understanding High-Stakes Consumer Decisions: Mammography Adherence Following False Alarm Test Results. Marketing Science 2003 (forthcoming).

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