



# How making a risk estimate can change the feel of that risk: shifting attitudes toward breast cancer risk in a general public survey

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## Abstract

Counseling women about breast cancer risks has been found to decrease screening compliance. We investigated whether women's reactions to risk information are an artifact of requiring women to estimate the risk of breast cancer prior to receiving risk information. Three hundred and fifty-six women were randomized to either make or not make a risk estimate prior to receiving risk information. Outcome measures were participants' estimates of the average woman's breast cancer risk and their emotional response to the risk information. Women overestimated the lifetime risk of breast cancer ( $M = 46\%$ ). Women who made risk estimates felt more relieved about the risk and perceived the risk as being lower than women who did not make estimates ( $p$ 's  $< 0.001$ ). Asking people to estimate risks influenced their subsequent perceptions of the risk of breast cancer.

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## 1. Introduction

To make decisions, patients need information. In the not-so-distant past, it was often difficult for patients to obtain health care information. Oncologists, for example, used to withhold cancer diagnoses from patients, for fear that such information would make patients too anxious [1,2]. Today, however, patients are much more involved in their health care decisions, receiving information from health care providers, television and print media, and, increasingly, from the Internet. Because patients are more involved with their decisions, clinicians need to be aware of when medical information impacts patients' medical judgments and decisions.

Educating patients may seem like a straightforward way to help patients make good medical decisions, but patient education sometimes generates results opposite from those

intended. For example, after undergoing risk counseling to help them make decisions about breast cancer prevention, some women (aged 40+) became less motivated to undergo mammography, perhaps because they perceived the risk (13% on average) to be too low to be concerned about [3]. This perception may have arisen because, prior to receiving risk information, the women had typically overestimated their lifetime risk of breast cancer. Numerous studies have shown that many women perceive the risk of breast cancer to be at least 10% higher – and in many cases over 25% higher – than the actual risk [4–7]. In comparison to this number, the actual 13% risk figure may seem quite low. Clinicians seem to face a dilemma – if they give patients accurate risk information, their patients may be too relieved to worry about engaging in preventive health care behaviors.

Should clinicians avoid telling women about their lifetime risk of breast cancer? Is it better to keep women in the dark, so they remain motivated to pursue preventive measures? That depends on whether women carry around

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risk estimates in their heads before they receive risk information from clinicians. Risk counseling has been shown to reduce interest in mammography only in research settings where, prior to receiving risk information, women were asked to provide risk estimates. Thus, women may have become less interested in screening merely as an artifact of the experimental methodology.

Risk communication researchers have shown that the context surrounding risk figures influences the perception of that risk. For instance, Windschitl et al. found that when participants were told that a medical condition had a 12% prevalence for women, their perception of women’s vulnerability to that disease differed based on whether the prevalence rate for men was higher or lower than the rate for women [8]. Women were considered much more vulnerable when the men’s rate was 4% (8% less than the rate for women) than when it was 20%. Other research has shown that greater perceived vulnerability to breast cancer is related to a higher incidence of mammography screening [9].

How the risk of breast cancer is discussed may also affect how a woman feels about that risk. Imagine a woman who has never thought explicitly about the lifetime risk of developing breast cancer and who, in fact, has very little idea what this risk is. When asked, she might estimate the risk as being “45%.” Once she has made this estimate, the actual 13% figure might feel very small. But how would that 13% figure have seemed if she had not been asked to make the estimate?

In this study, we presented women with information about the average lifetime risk of breast cancer. We then assessed how anxious or relieved they were by this information. We randomized participants so that half were asked to estimate the risks of breast cancer prior to receiving this risk information, and half were not. This randomized experiment, therefore, allowed us to test whether people react differently to risk information after they have been asked to estimate the risks.

## 2. Methods

### 2.1. Participants

We surveyed a convenience sample of women: prospective jurors in the Washtenaw County Courthouse, visitors to the cafeteria in the University of Michigan Medical Center, and patrons of several area coffeehouses and food courts. We informed them that the survey would take approximately 5 min to complete and that they would receive a candy bar for completing the survey. Those agreeing to participate received the written questionnaire. Of those approached, 72% agreed to participate. The questionnaire was written in English, thus those women who could not read English were excluded from the study. There were no other inclusion/exclusion criteria.

### 2.2. Questionnaire design

The primary outcomes of interest were participants’ estimates of the lifetime risk of breast cancer for the average woman and their emotional response to the actual risk of breast cancer.

We randomized participants to one of two risk elicitation protocols (see Fig. 1). Half of the participants (the “estimate” group) were first asked to estimate what they thought “the chance is that the average woman will develop breast cancer in her lifetime.” The response format was a blank line followed by a percent sign. After they made their estimate, participants were then provided with statistics about the lifetime risk of breast cancer. The remaining participants (the “no estimate” group) were first presented with the risk information and then asked to indicate (using a five-point Likert scale) whether the risk information they received was lower than they had expected, about the same as they had expected, or higher than they had expected.

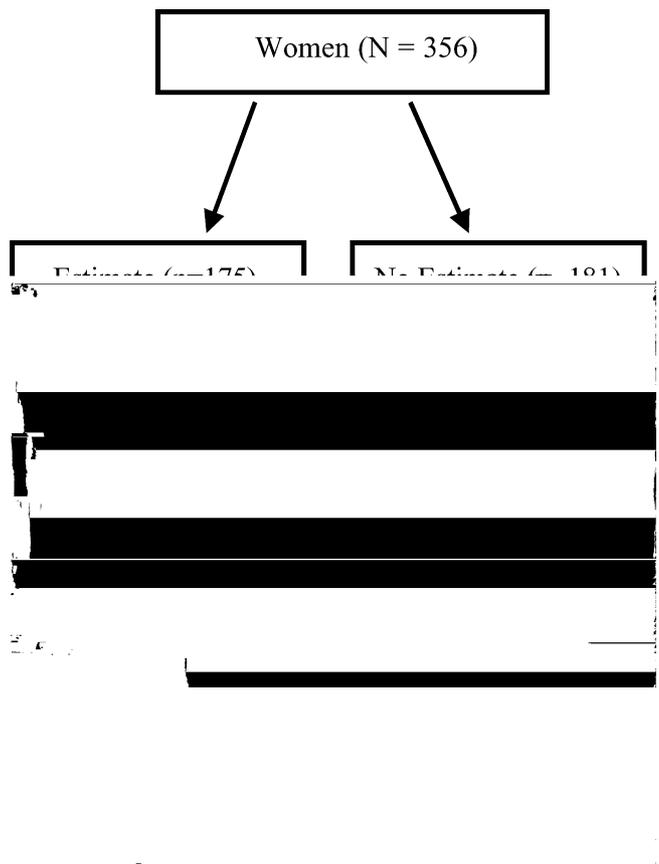


Fig. 1. Study design.

All participants then answered questions about their reactions to the risk information they had been provided. Most notably, participants were asked how the risk made them feel (1 = very relieved to 5 = very anxious, midpoint unlabeled) and how the risk of breast cancer struck them (1= as an extremely low risk to 5 = as an extremely high risk, midpoint unlabeled). Because numeracy has been shown to affect risk judgments [10], we also measured participants' objective numeracy skills using an adaptation of questions previously developed by Schwartz [10] and Lipkus [11]. Finally, we collected standard demo-

Fig. 2. Percent of women who perceived 13% lifetime risk of breast cancer as 'low' and the percent of women who felt 'relieved' when hearing the risk information.

the risk as greater than 15% were classified as over-estimators. For those in the no estimate group, we categorized women who responded "1 or 2" as over-estimators, "3" as accurate estimators, and "4 or 5" as underestimators. This allowed us to compare the relative frequency of accurate estimates versus overestimates versus underestimates between the two estimate groups. The results point to a large discrepancy in the accuracy of the estimates, with those in the no estimate group assuming higher accuracy than those who actually made the risk estimates ( $p < 0.001$ ).

### 3.2. Reaction to risk information

All participants answered several questions regarding their perceptions of breast cancer, and responses were compared based on whether or not they had made risk estimates. Participants were first asked to rate on a five-point scale "How does this risk make you feel?" (1 = very relieved and 5 = very anxious). As shown in Fig. 2, 40% of participants in the estimate group reported a feeling of relief (score of 1 or 2). In contrast, only 19% of participants in the no estimate group reported relief and instead showed significantly greater anxiety than those in the estimate group (25% versus 12% responding 4 or 5). A test of mean responses showed that anxiety level differed by estimate classification (2.66 versus 3.09,  $t = 4.99$ ,  $p < 0.001$ ).

Similar findings were found in the comparison of participants' response to the question "How does this risk of breast cancer (13%, or 13 out of 100 women) strike you?" As shown in Fig. 2, 43% of women in the estimate group viewed the risk as "low" (score of 1 or 2). In contrast, only 16% of participants in the no estimate group viewed the risk as "low" and instead tended to view the risk as high (37% versus 22% responding 4 or 5). A test of mean responses showed that risk perception again differed by the estimate randomization (2.78 versus 3.27,  $t = 4.95$ ,  $p < 0.001$ ).

### 3.3. Effect of numeracy on risk estimates and reaction to risk information

Because we were concerned that these results could be influenced by the numeracy of participants [10], we used a

six-question objective numeracy measure to examine the relationship between numeracy and participants' responses on three key questions (risk estimates, how does this risk make you feel, and how does this risk strike you). Forty-six percent of participants answered four or fewer questions correctly and were classified as lower numeracy, while the rest were classified as higher numeracy. Risk estimates given by higher numeracy participants were significantly more accurate than those provided by lower numeracy participants (with mean estimates of 37% and 51%, respectively,  $F = 15.20$ ,  $p < 0.001$ ). Numeracy was not related to participants' ratings of how the risk made them feel or how the risk struck them ( $t$ 's  $< 1$ ,  $p$ 's  $> 0.60$ ). In addition, dividing the sample into higher and lower numeracy subsamples did not change the main findings of the estimate versus no estimate randomization.

### 3.4. Role of individual characteristics in women's risk estimates and reactions to risk information

As Mah and Bryant have found that estimations of breast cancer risk can vary across demographic groups [12], we examined the relationship between all key dependent variables (risk estimate, how the risk made them feel, how the risk struck them) and age, race, and education. European American women's risk estimates were significantly lower than the estimates provided by women of other ethnicities ( $M = 39.80$  versus  $45.98$ ,  $F = 6.95$ ,  $p < 0.02$ ). Similarly, women with a college education provided significantly lower risk estimates ( $M = 36.09$ ) than women with some college education ( $M = 52.31$ ) or women with a high school or less education ( $M = 55.75$ ,  $F = 12.72$ ,  $p < 0.001$ ). No demographic characteristics were associated with women's reactions to risk information ( $p$ 's  $> 0.05$ ).

## 4. Discussion

In this study, we found that asking women to estimate the lifetime risk of breast cancer influenced their subsequent emotional response to accurate risk information. They do not typically know that the average woman's lifetime risk of breast cancer is 13%. When asked to estimate this risk, they typically overestimate it, substantially. These overestimates shape their response to subsequent risk information. Having guessed, on average, that 46% of women will develop breast cancer at some point in their lives, the 13% figure feels relatively low and fills them with a sense of relief.

Previous research that has examined cancer risk estimates has focused either on the assessment of that risk or on trying to improve the accuracy of risk estimates. Our study is the first we know of that has measured the psychological implications of receiving accurate risk information after making risk estimates. These findings are important for a number of reasons, both clinically and in the context of research.

#### 4.1. *Clinical practice implications*

Clinicians often encounter at least two types of patients. Some patients come to an appointment full of concern about their personal risk of developing cancer. Such individuals often have a plethora of information (both accurate and inaccurate) and vicarious experience (e.g., friends, family, co-workers) with regard to cancer risks. These people might have inaccurate perceptions of their risk, likely in the direction of overestimating their risk. This may be particularly true in cases where there is a family history of the disease. Physicians informing them of the relatively low risk of cancer may inadvertently lead patients to underappreciate their risk of cancer. Conversely, other patients may come into the encounter with few preconceived beliefs regarding their cancer risks. In this case, providing them with accurate risk information may result in the patients experiencing emotional duress and fear.

The current research suggests that clinicians need to be very deliberate in how they communicate risk information to their patients, particularly in the methods they employ when talking to patients about their risks. For instance, when talking with patients who have an unreasonably high fear of cancer, the best method of discussing their actual risks may be to first ask them to estimate their risk and then to follow up by providing them with the accurate risk information. Alternatively, if patients underappreciate their risk, the best method may be to provide them with the risk information directly and to not elicit risk estimates. Of course, it may be difficult for physicians to determine whether a person is likely to over- or under-estimate their risk of cancer. One way physicians can get around this is to subtly inquire whether their patient is worried about her cancer risk or if she has any family history of cancer. Questions such as these may alert physicians to patients that would benefit from making estimates, as well as to those patients for whom it would be harmful.

#### 4.2. *Research implications*

These findings have even more important implications for researchers, particularly those who conduct interventions with the aim of improving risk knowledge and attitudes, and for those who develop decision aids. Many studies in cancer risk communication literature have asked participants at baseline about their perceived risk of developing specific cancers. Researchers then implement an elaborate educational or counseling intervention to “correct” baseline risk estimates, and then measure participants’ risk perceptions, knowledge, and emotions following the intervention [4,13,14]. These studies often report that the interventions were successful at changing risk attitudes, perceptions, and screening/genetic testing preferences. Yet, our findings suggest that the method used to measure risk perceptions, pre-intervention, will influence people’s subsequent reac-

tions to risk information. This makes it difficult to discern whether it was the intervention that changed peoples’ attitudes or the pre-intervention risk estimate.

Our study has several limitations. First, we asked participants about lifetime risks for the average person, rather than about their own risk. Our results may have differed if we had asked participants about their current risk (at their age) rather than an average woman’s lifetime risk. However, previous studies have found that people significantly overestimate their personal risk [4–7]. Second, we do not know whether asking people to make risk estimates would influence actual screening behavior. Nor do we know whether the emotional impact of such estimates is long- or short-lived. Nevertheless, given that many health care decisions are made “on the spot,” developers of decision tools and counseling programs should beware of the likelihood that any attempt to measure attitudes at baseline could influence people’s subsequent attitudes. Third, we used a convenience sample, which limits the generalizability of the study. However, our fi

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