In this issue of the Journal, Petracci et al. (1) present a model to estimate the degree of benefit in terms of breast cancer risk reduction that may be achieved with risk factor modification. By how much would breast cancer risk change over a 10-year period for a 45-year-old Italian woman making changes in modifiable risk factors such as exercise, weight, and/or alcohol use? According to this well-designed and conducted study, all of the following answers are correct: 0.4%, 0.6%, and 20.5%. These figures refer to individual absolute risk reduction, population-level absolute risk reduction, and population fractional risk reduction (akin to the population attributable risk), respectively, and are associated with change in one (individual absolute risk reduction) or all modifiable risk factors (population-level risk reduction estimates). The compatible, yet disparate numbers, for the absolute risk reduction and fractional risk reduction risk estimates is a difficult concept to grasp—even more challenging is when and how to apply the estimates. The results of this study provide a welcome spotlight on the complexity of predicting, interpreting, and communicating risk on both an individual and population level.

By sound statistical methodology and data from a well-designed, large, Italian, multicenter case–control study of invasive breast cancer, Petracci et al. (1) extend previous work on breast cancer prediction models by incorporating modifiable risk factors and assessing the potential reductions in risk that might result if the modifiable risk factor profile could be optimized. The calibration and discriminatory ability of the model when evaluated in an independent cohort was similar to other prediction models (1,2).
The juxtaposition of the absolute risk reduction and the fractional risk reduction expected by achieving the optimal modifiable risk factor profile in an individual and in the population is a major strength of the study. Table 4 in the study provides a concise display of the gains in risk reduction in a population on both an absolute and relative scale that may be expected with complete adoption of the low-risk profile for modifiable factors (ie, assuming women never drank alcohol, exercised at least 2 h/wk, and maintained a weight of <25 kg/m² after the age of 50). Mean fractional risk reductions over 10 and 20 years are consistently in the range of 20%–25%. This magnitude of risk on the relative scale reflects rather modest risk reductions on the absolute scale in the range of 0.6%–4.4%, depending on the risk group. It is important to note that optimistic and unrealistic assumptions underlie these risk reduction estimates. The models assume that all women in the population would convert to the low-risk group for the modifiable risk factors with an immediate and long-lasting impact on risk. Therefore, as the authors point out, these risk reductions are the largest reductions in absolute risk that could potentially be achieved.

This article provides extremely important information relevant to counseling women on how much risk reduction they can expect by changing behaviors and also highlights the basic public health concept that small changes in individual risk can translate into a meaningful reduction in disease in a large population (3). However, caution should be exercised in applying the results of this study to other populations, such as the United States. A comparison of breast cancer incidence rates from the Florence Cancer Registry collected between 1989 and 1993 (1) with data from the Surveillance, Epidemiology, and End Results program in the United States (4) during a similar time period demonstrates similar age-specific rates of breast cancer up to the age group of 50–55 years. However, age-specific rates in older age groups display a marked divergence, with US breast cancer rates being 40%–70% higher than the rates in Florence. These differences, however, serve to emphasize the need for models such as these to be created on the basis of local data to provide the best estimates of risk to aid decision making, whether for the individual or the population in public health settings.

The seemingly disparate risk reduction estimates raise the question of which risk estimate is the most appropriate to use and when. A review of the effect of using alternative methods of presenting risk reductions on understanding, perception, and persuasiveness by health professionals and consumers found that the relative risk reduction, compared with the absolute risk reduction, was perceived as larger and more persuasive by both health professionals and consumers (5). Because of the potential for relative estimates to lead to misperceptions of the absolute value of benefits and risk by consumers and clinicians, a strong argument could be made that relative risk reduction should always be accompanied by presentation of absolute risk reductions (5). The model presented by Petracci et al. (1) enables these comparisons to be made.

What should the future hold in this area of risk prediction? First, there needs to be verification that changing behaviors, as well as preventing the adoption of poor risk behaviors, will lead to a change in breast cancer risk. Another consideration for high-risk women is to combine models that examine risks and benefits of chemoprevention (6,7) into models measuring the potential benefit of changing modifiable risk factors. Women at high risk often want to know what benefit they might gain from both lifestyle choices and chemoprevention, and models such as the one developed by Petracci et al. (1) would assist in counseling these women. Another consideration for use in the primary care setting would be to expand the model to include a composite health outcome because the behaviors examined in this study, namely weight, alcohol intake, and exercise, influence a plethora of health outcomes, not just breast cancer. For risk factors that influence a wide array of chronic diseases, estimating benefits of lifestyle changes on multiple health outcomes would provide a clearer picture of overall health benefits and would likely have a greater effect on making positive behavioral changes.

Making risk predictions of breast cancer, particularly with imperfect models (as all currently available risk prediction models are), can be risky business. There is uncertainty in the estimates, especially for the individualized estimates, and few behaviors are absolutely risk-free or without unintended consequences. Medical decisions are made explicitly or implicitly on the basis of assessments of the risks and benefits of interventions on health outcomes. The manner in which these risks are conveyed may greatly influence medical and public health decisions, and both absolute and relative risk reductions may assist in making fair and realistic estimates of what can be gained by changing behaviors or taking other prevention measures. Small changes in individual risk can have important effects on large populations, but individuals have a right to information that will help them assess how much they should invest in a particular behavior change to gain that small benefit. In addition, those who have been diagnosed with cancer may benefit from knowing how much, or how little, their lifestyle choices may have influenced the development of their cancer.

Models that not only quantify risk but also assist in estimating the benefits of modifying risk factors, such as the one developed by Petracci et al. (1), are extremely useful in counseling patients on an individual level and in guiding policy decisions on a population level. How best to apply these models in the clinical and policy setting, the impact on actual behavior change, and subsequent decreased incidence are fertile grounds for further research.

References

Affiliation of author: The Prevention and Research Center, Mercy Medical Center, Baltimore, MD.