Quantifying the Contribution of Overdiagnosis on Gains in Life Expectancy for US Breast Cancer Patients, 1975-2002

Objectives. Overdiagnosis chiefly occurs among women diagnosed with the smallest breast cancers and artificially inflates the share of these smallest tumors among all incident cancers. We quantified the maximum contribution of overdiagnosis to gains in life expectancy among US breast cancer patients between 1975 and 2002.

Methods. We calculate incidence-based mortality rates by age and year at diagnosis and tumor size (<1cm, 1-2cm, 2-5cm, ≥5cm). Using demographic decomposition, we quantify how much of the overall gain in life expectancy resulted from [1] changes in the annual share of cancers by tumor size, [2] improvements in mortality from breast cancer, and [3] improvements in mortality from competing causes. We also calculate the annual proportion of cancers by tumor size that resulted in death from breast cancer within 10 years of diagnosis. The maximum contribution of overdiagnosis equals the product of [1] the proportion of <1cm cancers that did not die of breast cancer within 10 years and [2] the contribution of the annual share of <1cm cancers on the gain in life expectancy.

Results. Life expectancy increased by 10.8 years (1975 to 2002). The increase in the annual share of <1cm cancers among all incident cancers (5% in 1975, 20% in 2002) contributed 4.8 years to the gain in life expectancy. The proportion of <1cm cancers that resulted in death from breast cancer within 10 years of diagnosis equaled 4% in 2002 (lowest level in study period).

Under the most conservative assumption that the remaining 96% of <1cm cancers were overdiagnosed, the maximum contribution of overdiagnosis for <1cm cancers equals 4.6 years (96% of 4.8 years). Thus, overdiagnosis contributed, at most, 4.6 of the 10.8-year gain in life expectancy (39%). Under the more realistic assumptions of 10% overdiagnosis based on clinical trial evidence, the contribution of overdiagnosis for <1cm cancers equaled 0.

Conclusion. Most of the observed gain in life expectancy resulted from improvements in breast cancer treatment rather than artificially from overdiagnosis.