Background and Purpose

A positive association between breast cancer incidence and socioeconomic status (SES) has been well-established through hundreds of studies. This relationship has been explained by differences in reproductive history, physical activity, genetic factors, and mammography rates, though taken together they insufficiently explain the observed patterns. In New York State, there is about a 50% difference in local-stage breast cancer incidence rates among white non-Hispanic women between the wealthiest and poorest communities, as defined by census tract of residence at diagnosis (Fig. 1).

For in situ diagnosis, however, the difference is more than twofold, all of which occurs in the upper half of the income distribution. Rates of in situ breast cancer are actually about the same for poor and middle-income women (Fig. 2). As middle- and upper-income women share many of the same risk factors, we hypothesized that differences in mammographic technology could explain some of this disparity. Specifically, several studies have suggested that digital mammography is more sensitive at detecting breast lesions than film mammography, and like many new technologies, digital mammography was more rapidly adopted in wealthier communities.

Methods

Using Medicare claims data from a sample of women aged 65 and over from New York State without cancer for the period 2004–2012, we examined the type of screening and diagnostic mammograms that were delivered, as determined by HCPCs codes: digital mammograms, film mammograms with computer-aided analysis, and film mammograms alone. We calculated the proportion of mammograms that were digital by year and ZIP code of patient residence and related this to median household income, presenting the results in both timeline and map formats.

Results

Our study period corresponded to widespread adoption of digital mammography. In 2004, 10% of the poorest women and 24% of the wealthiest women received their mammograms digitally (Fig. 3). By 2012, the corresponding numbers were 87% and 99%. The socioeconomic disparity persisted over the entire period, peaking in 2008-2009 when the gap between poorest and wealthiest was about 30%. Similar results were found for both screening and diagnostic mammograms (only the former shown).

A map of digital mammography adoption also captures the disparity (Fig. 4). Percentages are generally higher in the wealthiest urban and suburban markets, with cities like Binghamton standing out as early adopters. Within New York City, rates are substantially higher in Manhattan, Staten Island, and the outer part of Queens than in the Bronx or Brooklyn.

Table 1 suggests that even at the peak of the technology disparity in 2008, the corresponding in situ rate difference would have been only about 13% between the poorest and wealthiest women, and only 8% between the wealthiest and middle-income women. Given that the observed difference in rates was more than 100%, differential access to digital mammography accounts for only a small proportion of the in situ breast cancer rate difference. This would have dwindled almost to nothing as digital mammography approached being nearly universal; as of May, 2016, over 97% of the licensed machines in the U.S. use this technology. There remain additional unexplained factors driving socioeconomic disparities in localized and in situ breast cancer.

Discussion

In the last few years, a new technological disparity has emerged in the form of 3-D digital tomosynthesis, which is currently available primarily in wealthy practices. Since it was recently approved for reimbursement by Medicare, it is likely poised for much wider adoption. It is still too early to know how this technology will influence breast cancer rates, but at least one study suggests there will be similar effect as was seen with digital mammography: 3-D digital tomosynthesis offers higher sensitivity and higher specificity, which can be expected to translate into higher breast cancer rates, along with a small and temporary increase in socioeconomic disparities.

References


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