Health Awareness Campaigns and Diagnosis Rates: Evidence from National Breast Cancer Awareness Month

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Abstract

Awareness campaigns are often used to encourage medical screening that allows for early detection of health problems, but much remains unknown about the effectiveness of these programs. This paper evaluates whether National Breast Cancer Awareness Month (NBCAM) has led to increased diagnosis of breast cancer. The analysis examines the number of diagnoses made in November (one month after NBCAM) during years before and after NBCAM was initiated. We find that from 1993 to 1995, the period when breast cancer advocacy was expanding rapidly into a nationwide movement, NBCAM led to an increase in the number of November diagnoses. During earlier periods (from the mid-1980s to the early-1990s), when breast cancer advocacy was still a nascent grassroots movement, and in later periods, when breast cancer advocacy had become a well-established nationwide cause, there is little evidence that October NBCAM events had an effect on November diagnoses.

Keywords: breast cancer, National Breast Cancer Awareness Month, awareness campaign, health campaign, diagnosis, mammography, screening

I. Introduction

Health organizations often undertake campaigns to increase the public awareness of a particular disease. Some health campaigns are designed simply to raise general awareness of a particular health threat, like the Memorial Quilt displays for AIDS or the American Heart Association's "Wear Red Day" for heart disease in women. Other campaigns have more specific goals, such as convincing individuals to reduce risky behaviors (such as the Office of National Drug Control Policy's "Above the Influence" campaign telling teenagers to refrain from drug and alcohol use) or the promotion of preventive health actions (such as the U.S. CDC's 2002-2006 "VERB: it's what you do" campaign, which sought to increase physical activity levels in youth). Additionally, a number of campaigns focus specifically on increasing early detection of disease, such as the U.S. CDC's "Screen for Life" campaign that features celebrities who promote colorectal cancer screening.

This paper evaluates the effect of one of the best known and longest running detection campaigns: National Breast Cancer Awareness Month (NBCAM), which was first established in 1985. A primary goal of NBCAM is to encourage regular breast examination so that disease can be diagnosed at an early stage. Early diagnosis and treatment of breast cancer is associated with higher survival rates (Eyre, 2004) and lower treatment costs (Cohen, 2008). We chose NBCAM as our focus because it is a high-profile nationwide campaign that began more than two decades ago and because we can exploit the linkage of NBCAM to a particular part of the calendar year (the month of October) in our empirical design. We are able to evaluate whether the campaign's promotion of breast cancer screening in October was effective at increasing the number of diagnoses of breast cancer in November (since there is typically a one-month lag time between

screening and confirmed diagnosis). We are also able to examine how the effectiveness of the campaign at increasing November diagnoses has fluctuated over time.

We test whether NBCAM is effective at leading to an increase in earlier diagnoses by examining monthly diagnosis patterns across time. The analysis focuses on the number of diagnoses made in November during years before and after NBCAM was founded. We find that from 1993 to 1995, the period when the breast cancer advocacy was expanding rapidly into a nationwide movement, NBCAM appears to have contributed to an increase in the number of November diagnoses. During the mid-1980s to the early-1990s when breast cancer advocacy was still a nascent grassroots movement, and in later periods, when breast cancer advocacy had become well-established nationwide, there is little evidence that NBCAM events had an effect on November diagnoses. We hypothesize that the declining effect of NBCAM is due to an increase in routine screening, as opposed to event-driven screening, among women in the United States. In support of this explanation, we document increasing uniformity in the distribution of diagnoses across calendar months from 1973 to 2005.

In sum, our findings suggest that the breast cancer awareness movement has been successful in promoting earlier detection of disease. The success is likely due both to an increase in immediate diagnoses in response to specific events (as tested for in this paper) during the early years of the campaign and to cumulative increases in public awareness that led to year-round behavioral changes in more recent years. Our findings underscore that campaigns focused on the promotion and adoption of beneficial health behaviors will have their greatest impact when they target behaviors that have not yet reached a high degree of social normalization. One implication of our findings is that health campaigns that have succeeded in creating sustained behavior change in the target population may be most effective if they shift their focus to new objectives,

such as increasing fundraising for research and development of new preventive measures and new therapies. This transition has already occurred for many breast cancer advocacy organizations.

This paper proceeds as follows. Section II discusses related literature. Section III provides background information on the breast cancer awareness movement and National Breast Cancer Awareness Month. Section IV describes the data and methods. Section V discusses results. Section VI concludes the paper.

II. Related Literature

A substantial empirical literature has focused on understanding the determinants of screening behavior,[1] and a number of studies have examined the relationship between health campaigns and screening rates.[2] Most related to this paper, Barlow (2005) examines mammography data from 1994 to 2003 and finds that during these years there tended to be more mammograms in NBCAM (i.e., October) than in other months. Other studies have examined other determinants of screening behavior. For example, Wu (2003) finds that individuals who are already in poor health are less likely to seek out certain screenings, including breast cancer screening, and that this is perhaps due to fear and anxiety. Whynes et al. (2007) find that screening is driven primarily by a search for reassurance, a sense of duty, and herd signaling.

While increases in screening are important, it is equally important to establish whether awareness campaigns actually lead to new diagnoses. Increases in screening rates may not lead to increased diagnoses if, for example, the individuals who respond to awareness campaigns are

[1] Screening has also been analyzed in theoretical models. Byrne and Thompson (2001) show that under reasonable assumptions about preferences, individuals will seek a suboptimal amount of screening and that an optimal level of screening could be achieved by implementing an appropriate tax or subsidy.
[2] See Snyder et al. (2004) for a review of the relationship between mediated health campaigns and screening.

members of low-risk populations. In addition to this paper, one other paper has examined the relationship between breast cancer awareness campaigns and diagnoses. Catalano et al. (2003) examine the relationship between early breast cancer awareness efforts and diagnoses. Using quarterly diagnosis data from 1975 to 1997 in three metropolitan areas that sponsored awareness month activities during the early years of locally-sponsored breast cancer awareness months, they find that breast cancer diagnosis rates increased in each of these cities in the last quarter of the calendar year after the first community-based awareness months were started in 1985. Our study builds on this analysis by providing further evidence that awareness campaigns are effective at increasing diagnoses and new evidence that the effectiveness of awareness campaigns decreases over time.

III. Background on the Breast Cancer Awareness Movement

While efforts to increase awareness of breast cancer can be traced back to at least 1913, no ongoing organized efforts to increase breast cancer awareness existed until the mid-1970s, when a number of small advocacy groups began to disseminate information about treatment options and to provide counseling services (Lerner, 2002). The announcement that Betty Ford, the wife of U.S. President Gerald Ford, had undergone breast cancer surgery on September 28, 1974, is credited with increasing both public awareness of breast cancer and comfort with public discussions about the disease. Publicity about her breast cancer surgery led to a significant but temporary increase in breast cancer screening rates (Fink, 1978).

The 1980s were marked by increasing grassroots efforts to bring breast cancer to the national agenda (Lerner, 2002). The first breast cancer awareness month events were held in several communities across the country in October 1985 (Catalano, 2003). "Celebrity"

diagnoses continued to be an important impetus for seeking screening. For example, in the two months following the breast cancer surgery of Nancy Reagan, wife of President Ronald Reagan, on October 18, 1987, the proportion of women who had undergone a mammogram in the past twelve-months increased to 38%, as compared to 26% in January and February of the same year (MMWR, 1989).

The early 1990s marked the beginning of a truly national breast cancer advocacy movement. In 1991, the leaders of several grassroots organizations formed the National Breast Cancer Coalition (NBCC) with the express purpose of using political action to influence public policy related to breast cancer and to, as a result, increase funding for the disease (Visco, 1998). In 1993, NBCC and related organizations sponsored a nationwide signature drive to promote a national breast cancer plan, and they garnered a massive public response, with 2.6 million signatures collected and delivered to Washington, DC, in October of that year (Lerner, 2002; Visco, 1998). Funding for breast cancer research and care increased markedly soon thereafter, and donations to private breast cancer organizations also increased dramatically.[3] Popular engagement with breast cancer awareness efforts has remained strong since the mid-1990s, and breast cancer funding continues to be a priority area for the federal government.

As the breast cancer awareness movement has expanded, an increasing number of voluntary organizations, governmental agencies, and private corporations have sponsored events linked to National Breast Cancer Awareness Month (Lerner, 2002), which was first recognized as an official event by the federal government in the early 1990s. These events take a variety of forms, including fundraising walks, locally-organized sports events like golf opens, lectures for women's groups that feature stories of survivors, posters displayed in public places and

[3] The U.S. National Institutes of Health's budget for breast cancer research increased from less than $100 million annually in 1990 to more than $200 million in 1993 and more than $500 million by 1999 (Lerner, 2002). In 1991, the Susan G. Komen Foundation raised about $1 million; by 2009, it was raising nearly $350 million annually.

businesses, and "wear pink" days that show encouragement and support for those affected by breast cancer. The events typically also disseminate educational materials about breast cancer, including information about the importance of screening mammography. Some events focus primarily on increasing detection. For example, the National Breast and Cervical Cancer Early Detection Program (NBCCEDP) has offered free or reduced cost mammograms to low-income, uninsured, and underinsured women since 1991, and promotion events are often scheduled in October to coincide with NBCAM (MMWR, 2005; Parker, 1995).

Breast cancer outreach associated with NBCAM appears to have been effective at stimulating public education and interest. For example, media coverage of breast cancer has increased markedly in recent years, and October months have received substantially more coverage than other months. Figure 1 displays the number of publications in U.S. newspapers and wires indexed in LexisNexis Academics between 1973 and 2005 that mentioned "breast cancer." The number of October articles about breast cancer has increased nearly exponentially since the initiation of NBCAM. Fewer than 50 articles on breast cancer were indexed in each October from 1973 through 1985, but that number quickly rose to more than 600 in 1993, nearly 2000 in 1998, and more than 3000 in 2005. Additionally, the proportion of yearly reports occurring in October has also increased over time. In particular, the proportion of annual reports about breast cancer made in October has exceeded the proportion that would be expected if reports occurred uniformly throughout the year (i.e. 1/12) in every year since 1991. Blanchard (2002) also documents that articles about breast cancer in women's magazines and news magazines increased significantly from 1990 to 1999. More recently, "Google Trends," an internet resource that tracks the number of Google searches conducted for specific words and

phrases, shows a prominent spike in the number of searches for "breast cancer" in October during all years for which results are currently reported (2004 to 2009).

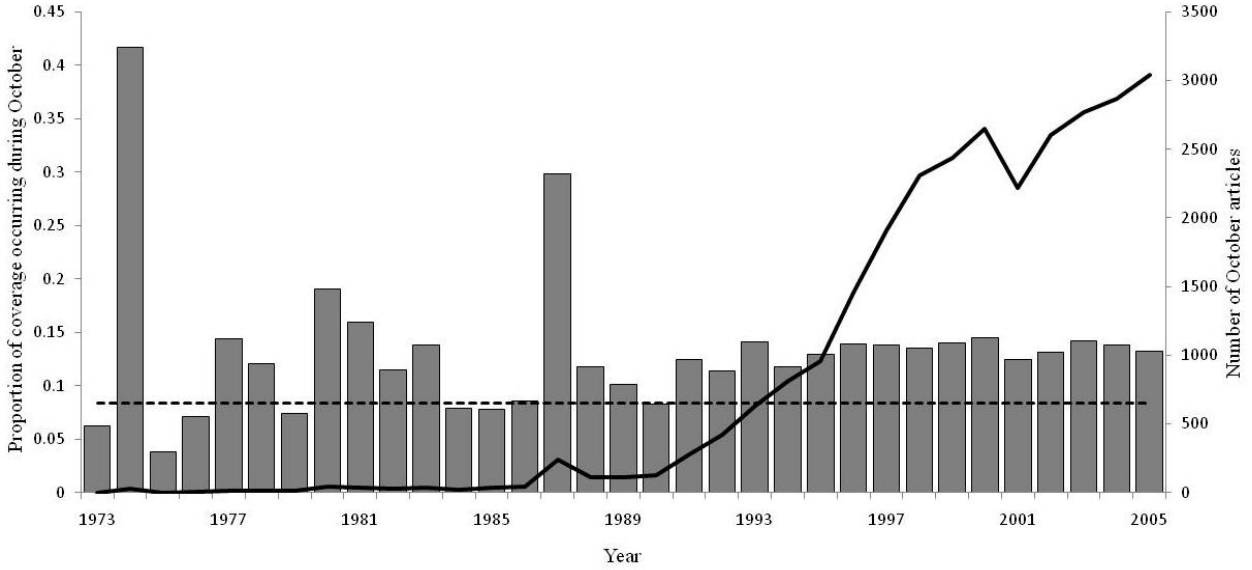

Figure 1: Media Reports of Breast Cancer: The solid line is the total number of publications on breast cancer during October in each year. The bars show the percentage of annual print media reports of breast cancer that were published in October. The dashed line shows the expected proportion of reports in October if articles were distributed uniformly across the year (i.e. 1/12). All counts are based on the number of articles in the LexisNexis Academics database that included the phrase "breast cancer."

Since the beginning of the breast cancer awareness movement, both screening rates and diagnosis rates in the United States have increased markedly. Breen (2007) reports that the proportion of women who reported having had a mammogram in the previous two years increased significantly from 29% in 1987 to about 70% in 1999. Figure 2, which we describe in the next section, shows an increase in both the number of diagnoses and the diagnosis rate during these years. A number of factors have contributed to these increases, including breast cancer awareness activities. It is not possible to quantify the total impact of organized breast cancer awareness efforts on diagnoses, but it is possible to test whether October NBCAM events have

affected November diagnosis rates and whether this effect has changed over time, and we present these results in the following sections.

IV. Data

To examine the effect of NBCAM on diagnoses, we acquired breast cancer diagnosis data from the Surveillance, Epidemiology, and End Results 9 (SEER 9) Registries Database. The database includes information from five states (Connecticut, Hawaii, Iowa, New Mexico, and Utah) and four metropolitan areas (Atlanta, Detroit, San Francisco-Oakland, and Seattle-Puget Sound). The breast cancer dataset includes information on 553,483 breast cancer diagnoses made between 1973 and 2005. Importantly, the SEER database contains information on both the month and year of each diagnosis in the registry.[4] The United States does not have a national cancer registry, so the SEER dataset is the most complete record of diagnoses available. Because SEER includes registries from all regions of the United States, the SEER data constitute a plausibly generalizable subsample of all cancer cases. Compliance with reporting of diagnoses in areas covered by SEER is very high (Zippin, 1995).

We aggregate the data into a time-series that reports the number of diagnoses made in each month of each year from 1973 to 2005. After aggregation, the dataset includes 396 observations. In Figure 2, we plot the total number of diagnoses and the rate of diagnosis per 100,000 women by year from 1973 to 2005.[5] There was a general upward trend in diagnoses and

[4] In particular, the SEER manual (available online at http://seer.cancer.gov/data/documentation.html) specifies that "the month of diagnosis is the month the tumor was first diagnosed by a recognized medical practitioner, whether clinically or microscopically confirmed."

[5] The graph plots the unadjusted incidence rate for all breast cancer diagnoses per 100,000 women. The age-adjusted rates are slightly lower.

diagnosis rates from the beginning of the sample in 1974 until around the year 2000.[6] From 2000 to 2005, the number of diagnoses remained approximately steady.

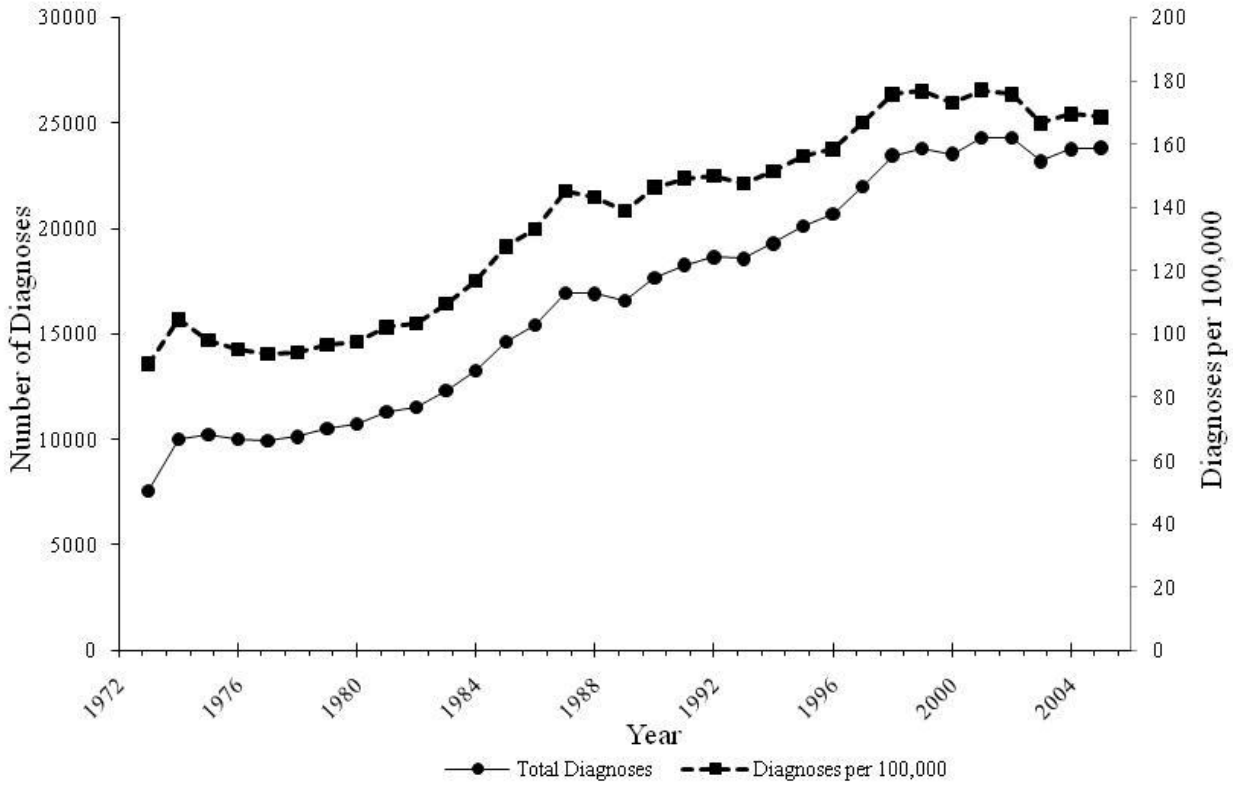

Figure 2: Diagnoses by Year, 1973-2005

Our empirical strategy examines whether October NBCAM events were effective at increasing detection by testing whether the number of diagnoses made during November, relative to the number of diagnoses observed, on average, in other months during the same calendar year, increased after NBCAM was implemented. We focus on November diagnoses because studies

[6] This general trend of an increase over the past several decades has also been noted by the American Cancer Society. The ACS reports that diagnosis rates were relatively constant between 1975 and 1980, increased by 4.0% per year between 1980 and 1987, were relatively constant between 1987 and 1994, increased by 1.6% per year between 1994 and 1999, and decreased by about 2.0% per year between 1999 and 2006, the most recent years available (ACS, 2009). These observations closely match the trends shown in the SEER data plotted in Figure 2.

have shown that the diagnostic delay between screening and diagnosis of breast cancer in the United States is about one month (Caplan, 2000).[7]

As a first look at the possibility of an NBCAM effect, we present graphical information on November diagnoses for each year in the sample. Figure 3 plots the difference between the proportion of November diagnoses in each year and the proportion that would be expected if diagnoses were distributed uniformly across calendar months (i.e., 1/12). There were prominent spikes in November diagnoses in 1974 and 1987, the years in which First Ladies Ford and Reagan were diagnosed with breast cancer, which suggests that diagnoses of celebrities were important motivators to seek screening during these pre-NBCAM years when awareness of breast cancer was relatively low. From 1993 to 1995, when the breast cancer awareness movement was rapidly expanding, there was a clear spike in November diagnoses, suggesting that NBCAM events were effective at increasing diagnoses in those years. There is little evidence that NBCAM was effective at increasing November diagnoses during the remaining years of the sample, from 1996 to 2005.

[7] The average time from initial screening for breast cancer to a diagnosis for participants in the National Breast and Cervical Cancer Early Detection Program from 1991 through 1995 was about 32 days (Caplan, 2000).

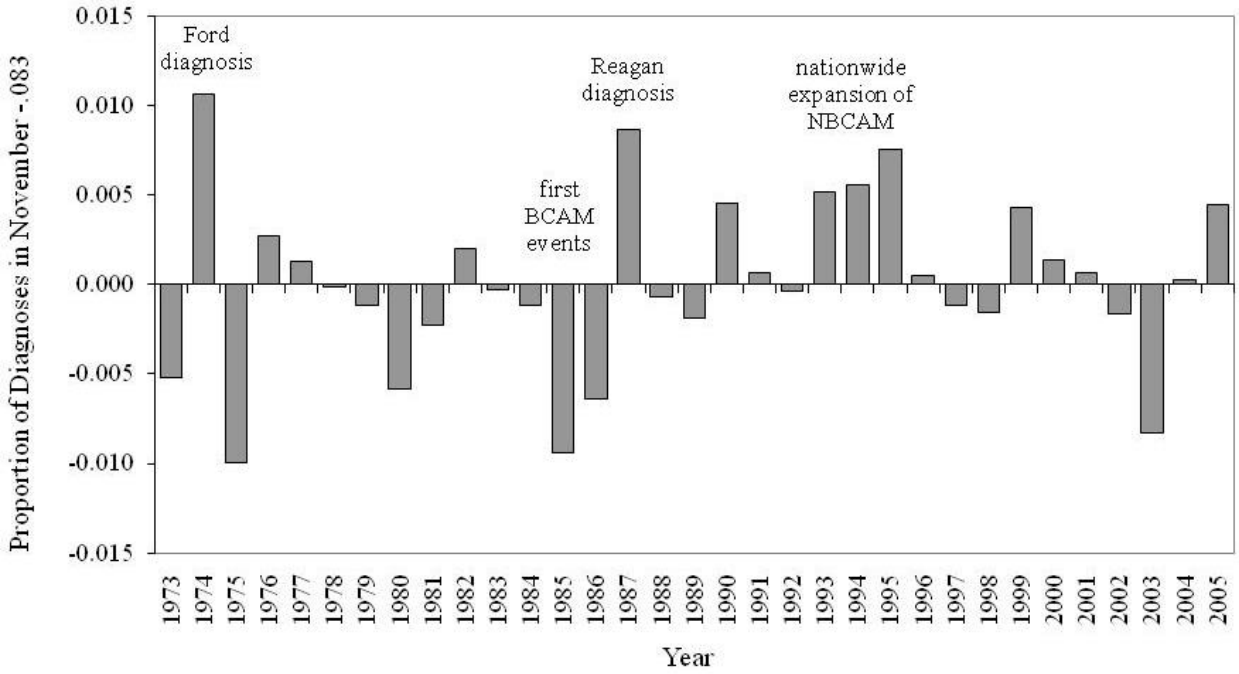

Figure 3: Share of yearly diagnoses occurring during November minus one-twelfth

V. Estimation

To estimate the effect of NBCAM on November diagnoses, we employ an ordinary least squares model with the following specification:

$$\ln(diagnoses_t) = \alpha + \sum_{i=1985}^{2005} \beta_i November \times NBCAMyear_{it} + \sum_{j=2}^{12} \lambda_j month_{jt} + \sum_{k=1974}^{2005} \delta_k year_{kt} + \gamma Ford_t + \varepsilon_t \quad , \qquad (1)$$

where $diagnoses_t$ is the number of diagnoses made in a given month t.[8] $Month_{kt}$ indexes a set of eleven dummy variables, one for each calendar month (January is the omitted month) that controls for seasonal patterns in diagnoses that are common to all years in the sample. $Year_{kt}$ indexes a set of 32 dummy variables for each year in the sample (1973 is the omitted year) that controls for year-to-year changes in the numbers of diagnoses that were common to all months

[8] Because the estimates from specification (1) reflect how each November compared to other months in the same calendar year, the parameters of interest (the set of parameters indexed by β_i) are identical whether we use the number of cases as the dependent variable or use the number of cases per capita. If SEER reported population data at the monthly level, then the estimates would potentially differ very slightly, but SEER only provides annual population estimates for areas covered by participating registries.

within a year. $November \times NBCAM\ year_{it}$ indexes a set of 19 interaction terms corresponding to interactions of a dummy indicator for whether an observation was a November month and 19 dummy variables indicating each of the NBCAM years from 1985 to 2005.[9] $Ford_t$ is a control variable for November 1974, which occurred shortly after the announcement of First Lady Betty Ford's (1974) mastectomy.[10] As usual, α is a constant and ε_t is a randomly distributed error term. We compute robust standard error estimates using Huber-White correction methods.

The coefficients of primary interest are the set of parameters indexed by β_i, which indicate the difference between the number of diagnoses observed in a selected November after breast cancer awareness month was initiated in 1985 and the number of diagnoses expected in that year if the relative share of annual diagnoses made during November was similar to the relative share observed during pre-NBCAM years. If the estimated coefficient is significantly greater than zero, then it is evidence that NBCAM led to additional November diagnoses of breast cancer in that year.

We display the results of this estimation in Figure 4. With the exception of the November following Nancy Reagan's diagnosis in 1987, there is little evidence that the number of November diagnoses during the early years of breast cancer advocacy (the mid-1980s to the early-1990s) were higher than expected. The average point estimate for the years from 1985 to 1992, not including 1987, is –.003. In contrast, during the period from 1993 to 1995, the period when breast cancer advocacy was expanding rapidly into a nationwide movement, there is substantial evidence of an NBCAM effect on diagnoses. All three Novembers show an increase

[9] A variety of other models were also considered, including models in which we interacted November with different groups of years that were coded to indicate different stages of NBCAM. These models all yielded similar results to those presented in the paper. We have chosen to present this particular model, in which we interact November with all NBCAM years, because it allows for the most complete presentation of year-to-year variation in November diagnosis rates since the initiation of NBCAM.

[10] We do not include a dummy variable for Nancy Reagan's diagnosis because that effect is controlled for by the $November\ x\ 1987_t$ variable in the set of interaction terms.

in diagnoses, with statistically-significant point estimates ranging from 9 to 12 percent. Excluding November 1987 (Reagan's diagnosis), these increases are the largest that occurred during any November after the initiation of NBCAM. After 1995 there is, once again, little evidence of an NBCAM effect.[11] The average coefficient over the ten years from 1996 to 2005 is .021.

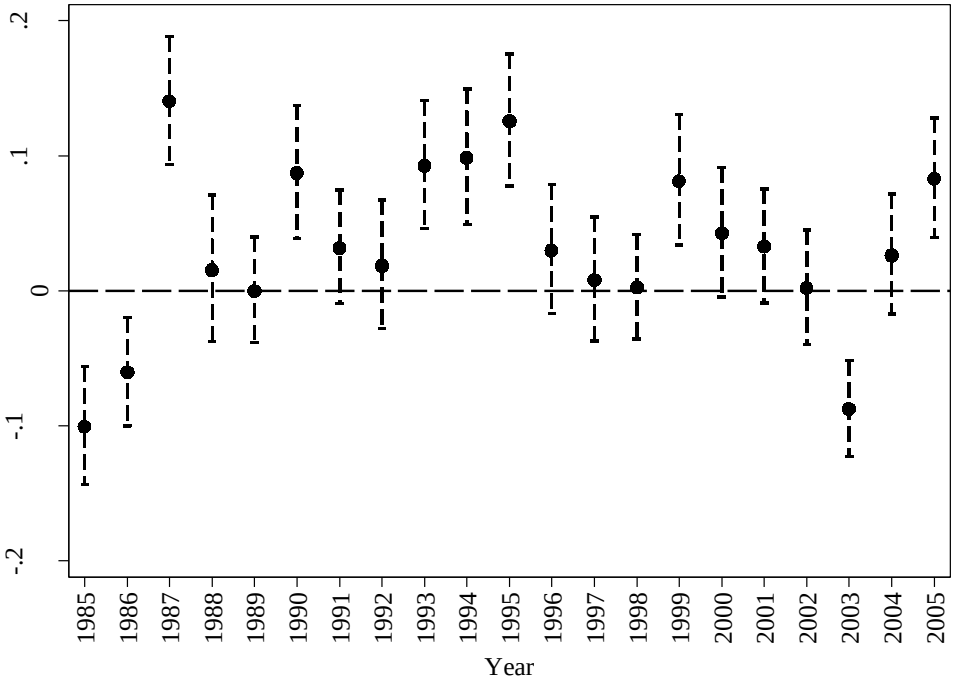

Figure 4: Estimation results - November diagnoses in post-NBCAM years: This figure plots the effect of different November months across time as estimated by equation (1). The dashed bars represent 95-percent confidence intervals. The most elevated November year is 1987, the year of Nancy Reagan's October breast cancer diagnosis. The three other years of greatest elevation occurred consecutively from 1993 to 1995, the period when breast cancer advocacy was expanding rapidly into a nationwide movement.

[11] There are some anomalies in the data, such as the significant decreases in November diagnoses in 1985, 1986, and 2003. Unfortunately, we were unable to find explanations for these observations. We did not identify any celebrity diagnoses or major breast cancer awareness events in earlier months in these years that would have been expected to significantly reduce the number or share of November diagnoses.

For the sake of brevity, we do not report the coefficients on the month and year dummy variables, but these results are as expected, with the coefficients on the year dummies generally increasing over time. The coefficients on the month dummies, which control for average seasonal patterns, range from –0.11 to .06. The coefficient on November, which controls for November patterns prior to 1985, falls in the middle of this range at –.042, indicating that diagnoses in November months were fairly similar to other months prior to NBCAM.[12] The adjusted *R*-squared from the estimation is 0.974, which reflects the fact that year-to-year shocks and seasonal effects can explain much of the variation in diagnosis patterns.

To evaluate the robustness of our results, we also employed a Poisson model. These results, which are reported in the Appendix, are quite similar to the results reported in the main text. Additionally, to evaluate the possibility of autocorrelation in the residuals, we performed a Durbin-Watson test. The result of this test, a Durbin-Watson statistic of 1.98, was not statistically significant, indicating that serial correlation is not a concern. Nonetheless, in the Appendix we report results from a Prais-Winsten linear regression that allows for first-order autoregressive residuals. These results are also extremely similar to those presented in the main text.

VI. Discussion

One explanation for why the NBCAM effect is not observed after the mid-1990s is that women are now more likely to undergo routine screening. The recent increase in routine screening, which has well documented (Breen, 2007), has reduced the proportion of women who

[12] The fact that pre-NBCAM Novembers were fairly typical is also indicated by summary statistics. During pre-NBCAM years, the share of annual diagnoses made during Novembers was, on average, 0.0825, which is very close to 1/12 (.0833) of the annual diagnoses.

have not been recently screened, and women who have been recently screened for breast cancer are unlikely to have another mammogram following a specific awareness event. As such, the pool of women who could be convinced to seek mammography in response to an NBCAM event is considerably smaller now than in the early 1990s. It seems very likely that some of the increase in routine screening has been driven by the breast cancer advocacy movement, and thus part of the decline in the impact of NBCAM on November diagnoses can be attributed to awareness saturation. An additional contributing factor may be that that increased use of computer-generated annual reminders and automatic scheduling have increased the share of women who undergo routine screening.[13] One implication of an increase in routine mammography across the calendar year is that monthly diagnosis rates should have become less responsive to awareness shocks of any kind, whether they are related to NBCAM or other events such as the diagnosis of a celebrity.

To examine this possibility, we evaluated whether the distribution of diagnoses has become more uniform over time. We generated a variable that indicates the fraction of annual diagnoses made in each month of from 1973 to 2005 and calculated a standard deviation for these values for each year. If diagnoses are highly responsive to specific events, such as celebrity diagnoses or NBCAM, then fraction of diagnoses made in each month will lack uniformity—there will be more awareness shocks—and the standard deviation will be relatively large. Alternately, if individuals tend to undergo routine screening (and consequently do not have event-based diagnoses), then diagnoses will occur at a relatively uniform rate throughout

[13] It does not appear that the increased demand for breast cancer screening has caused significant wait times for routine mammograms. A recent study of more than 1600 mammography facilities in the U.S. found that 55% had a wait time of less than one week and only 11% had a wait time of one month or longer (Elkin, 2009). This means that a woman who seeks mammography in October following an NBCAM-related event is likely to be able to schedule a mammogram fairly quickly, and there is no expectation that a diagnosis of breast cancer would be delayed until December or later due to delayed access to mammography services.

the year and the standard deviation will be smaller. Figure 5 displays standard deviations across years. A strong inverse linear relationship between year and standard deviation is evident (r^2=0.690), which indicates a significant trend toward diagnoses being spaced more evenly throughout each year and suggests that breast cancer diagnoses have become less responsive to awareness shock of any kind.[14]

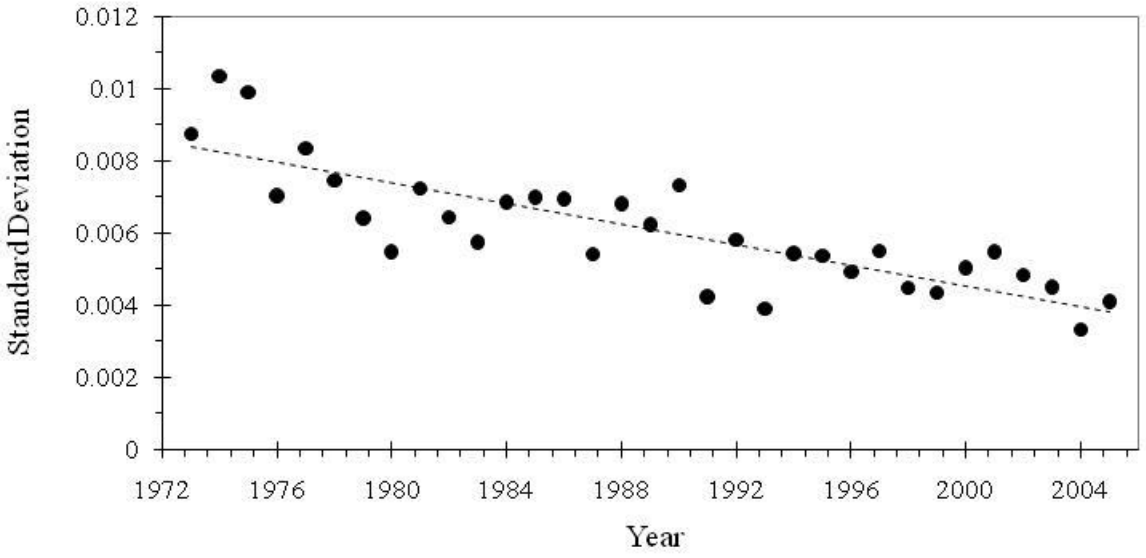

Figure 5: Standard deviation of the share of annual diagnoses in each month, by year

It is important to note that our analysis only provides a test for whether NBCAM has an immediate effect on diagnosis rates in the following month. It does not test for a longer-term effect on the population due to the cumulative effects of NBCAM on public awareness over time. If repeated exposure to breast cancer information via NBCAM over several years leads to an internalization of this knowledge and a change in individual and population behavior not linked to a particular month or event, such as an increase in routine mammography, this shift would not

[14] The apparent decrease in the sensitivity of diagnosis rates is also supported by a recent study that found that breast cancer diagnosis rates in Australia did not increase following the breast cancer diagnosis of popular singer Kylie Minogue even though a larger number of women than expected had breast imaging in the months after Minogue's diagnosis (Kelaher, 2008).

be detectable in an analysis of period-to-period dynamics. Providing a direct test, however, is an important contribution toward understanding whether awareness campaigns are effective in general and when they are the most effective in particular.

VII. Conclusions

Awareness campaigns are commonly used by health organizations to promote the increased detection and diagnosis of disease. This paper provides a test of whether these campaigns are effective and whether their effectiveness changes over time. We evaluate the specific case of National Breast Cancer Awareness Month, which occurs in October. We find evidence that NBCAM events were effective at increasing November diagnosis rates during the mid-1990s when the awareness movement was expanding rapidly across the United States. There is, however, little evidence that the NBCAM led directly to increased diagnoses in later years. We also document that the distribution of breast cancer diagnoses during the calendar year has become increasingly uniform from 1973 to 2005, which suggests that women have become less likely to be diagnosed as a result of specific events that increase public awareness, such as awareness campaigns or the diagnosis of a celebrity, and more likely to be diagnosed following routine mammography.

In sum, our results indicate that NBCAM was initially successful at increasing diagnoses of breast cancer in the following month. More recently, the increase in routine screening has contributed to a decrease in the impact of specific promotion events on new diagnoses. However, it is important to note that an increase in awareness of breast cancer brought on by specific events remains associated with other benefits. For example, breast cancer organizations now raise large amounts of money for research each year, and the relationships developed during

these fundraising events are an important source of support for women with breast cancer and for their families and friends. One implication of the findings in this paper is that well-established health campaigns may be most effective if they direct their efforts at outcomes other than increased diagnoses, such as increased fundraising or enabling patient support groups, once there is evidence of widespread general awareness of the disease and adherence to recommendations for use of routine screening tests if they are available.

The promotion of early detection of chronic diseases that can be more effectively and inexpensively treated at an early stage is an important area for public health. More research is needed to evaluate the extent to which campaigns lead to cumulative increases in public awareness and year-round behavioral changes, to identify which types of awareness campaigns are most successful in achieving various well-defined outcomes, and to examine which segments of the population are most responsive to different types of awareness campaigns. This paper provides one evaluation of the effectiveness of a high-profile awareness campaign in increasing diagnoses. Although the NBCAM campaign was initially effective in increasing diagnoses, the effect on immediate diagnoses has diminished over time as the movement has matured.

Appendix

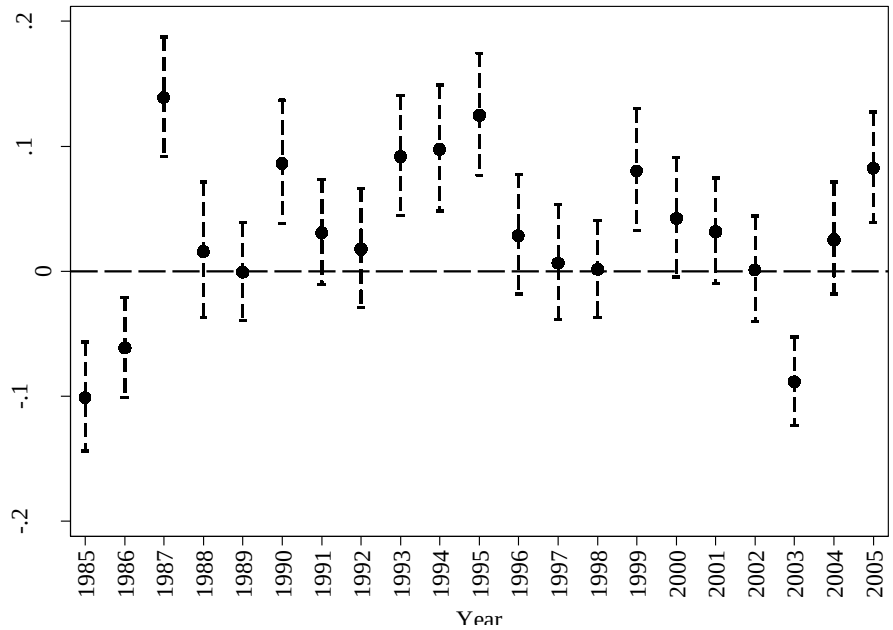

Figure 6: Prais-Winsten estimation results - November diagnoses in post-NBCAM years: This figure plots the effect of different November months across time as estimated by equation (1) using a Prais-Winsten model. The dashed bars represent 95-percent confidence intervals.

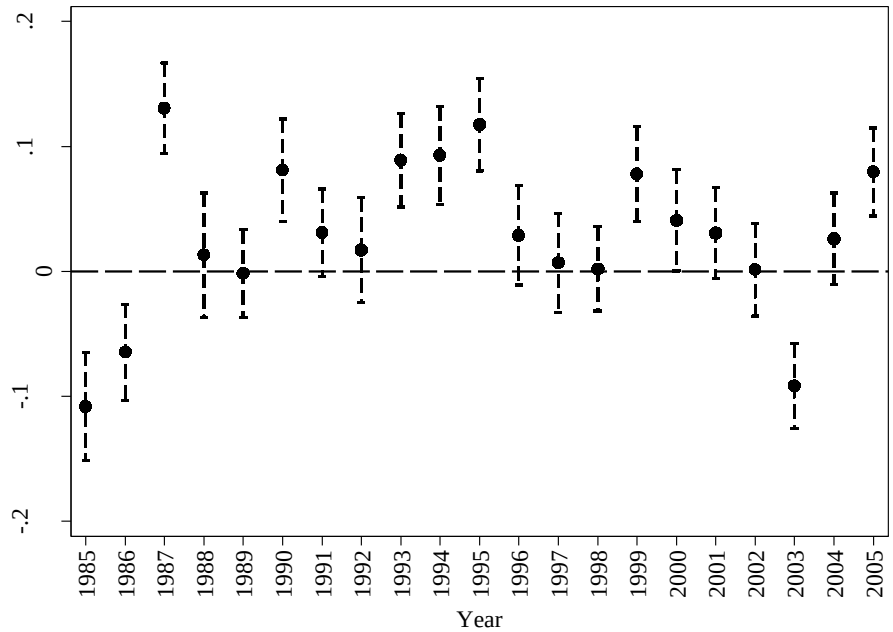

Figure 7: Poisson estimation results - November diagnoses in post-NBCAM years: This figure plots the effect of different November months across time as estimated by equation (1) using a Poisson model. The dashed bars represent 95-percent confidence intervals.

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