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AN EVALUATION OF A MEDICAID EXPANSION FOR CANCER CARE
The Breast and Cervical Cancer Prevention and Treatment Act of 2000

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The National Breast and Cervical Cancer Early Detection Program is a multifaceted, federal program that provides breast and cervical cancer screening and diagnostic services to low-income women, but does not cover the costs of treatment. This study used a fixed-effects, longitudinal time-series research design (from 1995 to 2005) to evaluate the impact of a Medicaid expansion aimed at covering treatment for program clients, enacted via the Breast and Cervical Cancer Prevention and Treatment Act of 2000. In summary, the Treatment Act of 2000 had some positive impacts, including a 12.8% decrease in the average number of days to definitive cervical diagnosis for White women. Nonetheless, the Treatment Act also had some negative impacts on the timing of diagnosis and treatment services, including a significant increase in the average time between a diagnosis of cervical dysplasia or cancer and the initiation of treatment for Black and Hispanic women (7–15 days across age groups). The Treatment Act was also associated with a 9% decrease in the probability that Black women would initiate treatment within 60 days of a cervical diagnosis (−.094; 95% confidence interval [CI] −.178 to −.01). As such, although the Treatment Act had no impact on the proportion of clients who initiated breast cancer treatment within 60 days, it reduced the probability that Black women initiated cervical treatment within an accepted benchmark for timely care.

Background

In 1990, Congress passed the Breast and Cervical Cancer Mortality Prevention Act (Public Law 101-354), which created the National Breast and Cervical Cancer Early Detection Program (NBCCEDP). The NBCCEDP is administered by the Centers for Disease Control and Prevention (CDC) with the goal of reducing morbidity and mortality associated with breast and cervical cancers among low-income and minority women (Henson, Wyatt, & Lee, 1996). Program components include free cancer screening and diagnostic tests to eligible low-income and uninsured/underinsured women, public education and outreach, professional education, quality assurance, and surveillance.

The NBCCEDP currently operates in all 50 states, the District of Columbia, a number of territories, and selected Native American tribes and tribal consortia. Between 2000 and 2005, the NBCCEDP provided over 1.6 million mammograms, of which 11.6% were abnormal; and 1.5 million Papanicolaou tests, of which 2.5% were abnormal (CDC, 2007). During this time period, the NBCCEDP diagnosed 12,588 women with breast cancer and 20,140 women with cervical cancer or precancerous cervical lesions (CDC, 2007).

Although the 1990 law appropriated significant federal resources for the early detection of breast and cervical cancers, it did not provide any funds for treating cancer or other conditions diagnosed through the program. The NBCCEDP was envisioned as a partnership between the federal government and state and local agencies already involved in identifying health care

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resources for the underserved and uninsured (Henson et al. 1996). Although the 1990 legislation allocated resources for screening and diagnostic tests, state and local resources were to be identified and established to cover the treatment needs of women diagnosed through the program. Although Congress stipulated that no program was to screen women without first establishing a "treatment network" or a cadre of providers willing to provide treatment services to uninsured women, the fact that the 1990 law did not cover treatment for conditions diagnosed through the program was controversial (CDC, 1998; Lantz et al., 2000; Lantz, Weisman, & Itani, 2003).

In response to concerns about the lack of coverage for treatment, the National Breast and Cervical Cancer Prevention and Treatment Act of 2000 (Public Law 106-354) was passed in the 106th Congress (Lantz et al., 2003). The Treatment Act allowed states the option of implementing a diagnosis-specific expansion of Medicaid with enhanced federal funding; women diagnosed with breast or cervical cancers or precancerous cervical lesions through the federal screening program would automatically qualify for Medicaid for the duration of their treatment. The policy architects of the Treatment Act believed that Medicaid coverage for treatment would 1) increase the number of women screened under the program, 2) assuage both client and provider concerns about costs, 3) reduce the significant amount of time and energy devoted to securing treatment resources, and, as a result, 4) increase the number of women who received definitive diagnosis and initiated treatment in a timely manner (Lantz et al., 2003).

Since 2000, every state has adopted this optional expansion of Medicaid, although there are differences in the timing and implementation across states (Miller 2007). French, True, McIntyre, Sciulli, and Maloy (2004) described how this Medicaid expansion was implemented across states, finding that collaboration and coordination among the several state and federal agencies involved served to facilitate the rapid adoption of the expansion. To date, however, no formal impact evaluation of the Treatment Act has been conducted. The goal of our study was to assess the impact of the Treatment Act of 2000 on the timing and receipt of cancer-related diagnostic and treatment services among the women served by the NBCCEDP.

Methods

A longitudinal time series analysis of NBCCEDP data was implemented to estimate the impact of the Treatment Act within its first five years on the timing of definitive diagnosis and treatment initiation, and on the proportion of women who received diagnosis and treatment with quality benchmarks established by the program. A number of quality benchmarks were developed by the NBCCEDP with the assistance of medical advisory boards and consultants, and are based on the published literature on clinical guidelines for breast and cervical cancer diagnosis and treatment. These benchmarks are clearly defined in NBCCEDP policy and procedure guidelines, and are used primarily for quality assessment and formative evaluation (Cochran, Moselev, & Pelteir, 2004). The benchmarks used in this analysis were receipt of definitive diagnosis within 60 days of an abnormal screening test and initiation of treatment within 60 days of definitive diagnosis. For breast cancer cases, we also looked at initiation of treatment within 30 days under the hypothesis that the Treatment Act increased the proportion of women starting their breast cancer treatment within one month of diagnosis.

The study design was a "natural experiment" using time series data from 1995 to 2005. State variations in the implementation date of the Medicaid expansion were exploited to investigate changes in program indicators regarding timely diagnosis and treatment. The "multiple time series design"—when there is variation in the timing of policy implementation across populations or geographic units that are being followed over time—is a strong research design for evaluating the impact of a policy change at the population level (Campbell & Stanley, 1966; Jones, 2000). In the absence of a pure control group that does not get exposed to the policy intervention, each state serves as a control for itself taking into account any underlying trends across multiple observations both before and after policy change. Also, variation in the timing of policy implementation across states provides further information on the policy impact. A multiple time-series analysis investigates whether or not there is a change in the slope and/or intercept of the trend line across states corresponding to the introduction of a policy change, which in this case is the implementation of a Medicaid expansion via the Treatment Act.

The data for this analysis were from the NBCCEDP surveillance database, combined with information on the timing of the Medicaid expansion in each state. All of the state, territorial, and tribal programs in the NBCCEDP are required to collect and report a certain amount of standardized, de-identified data on program clients twice a year, referred to as Minimum Data Elements (MDE). The NBCCEDP has several policies/procedures aimed at standardizing and enhancing the quality of the MDE data submitted. The MDE database contains information on patients' age, race/ethnicity, location (state), screening date, screening tests received, screening results, any diagnostic follow-up tests received and results, the number of days between screening and definitive/final diagnosis, the initiation date of any treatment received, and the number of days between final diagnosis and treatment initiation. Although there are very few missing data in the

MDE system, there is no public information on the validity of the data that are included.

The MDE database was used to create two files for analysis, one for breast cancer screening and one for cervical cancer screening. The sample included all women screened for breast and/or cervical cancers through the NBCCEDP who had an abnormal screening test requiring follow-up diagnostic services. The sample covered an 11-year period from January 1, 1995, to December 31, 2005, and included all 50 states and the District of Columbia ($n = 51$ programs). At the time of our analysis, national program data were only available through 2005.

The unit of analysis in the MDE records is a screening episode, with women screened through the program more than once represented as many times in the data. There were a total of 45,531 screening episodes for cervical cancer indicating some sort of abnormal finding needing diagnostic follow up, of which 29,518 resulted in a diagnosis that needed treatment. This includes 28,163 women diagnosed with "precancer" or cervical intraepithelial neoplasia II or III, or cervical carcinoma in situ; and 1,355 women diagnosed with invasive cervical cancer (American College of Obstetricians and Gynecologists, 2003). Unfortunately, in the MDE data available for analysis, it was impossible to distinguish between cases of cervical intraepithelial neoplasia versus in situ cervical cancer. Over the same time period, there were a total of 606,703 screening episodes for breast cancer with some type of abnormal result, of which 29,285 ultimately resulted in a diagnosis of breast cancer.

Dependent Variables

Several outcomes of interest were analyzed for both types of screening. Two continuous variables regarding timing were included as outcome variables, as defined below.

Time to diagnosis. This continuous variable measures the number of days between a screening test with an abnormal result and a definitive diagnosis. A definitive diagnosis after an abnormal cervical cancer screening test refers to either a final negative determination after follow-up is completed or a diagnosis of a condition in need of treatment, which includes cervical intraepithelial neoplasia II or III, carcinoma in situ, or invasive cervical cancer. A definitive diagnosis after an abnormal breast screen refers to either a final negative determination after follow-up was completed or a diagnosis of breast cancer. Cases without a date for final diagnosis were coded as 365 days.

Time to treatment. A continuous variable measuring the number of days between a definitive positive diagnosis and treatment initiation, this included all cases with a cervical diagnosis in need of treatment or a diagnosis of breast cancer. Cases without a date for treatment initiation were coded as 365 days.

Three dichotomous dependent variables also were analyzed to capture whether or not a woman received definitive diagnosis or initiated treatment within specific time periods or benchmarks.

Diagnosis less than 60 days (for breast and cervical screening). This captures whether or not the time between an abnormal screening test and definitive diagnosis was within 60 days. This was coded as a dichotomous variable indicating whether or not the time between an abnormal screening test and definitive diagnosis was less than 60 days. Those who were lost to follow-up or had no date for definitive diagnosis were coded as taking 60 days or more.

Treatment less than 60 days (for breast and cervical precancer/cancer). This variable captures whether or not the time between definitive diagnosis and treatment initiation was less than 60 days. It is coded as a dichotomous variable. Cases were excluded from this analysis if treatment was not indicated. Those who needed treatment but had no date for treatment initiation were coded as taking 60 or more days.

Treatment less than 30 days (breast cancer cases only). This captures whether or not the time between definitive diagnosis and treatment initiation was less than 30 days and is coded as a dichotomous variable. Those who needed treatment but had no date for treatment initiation were coded as taking 30 or more days.

Breast cancer screening included both mammography screening and clinical breast examinations. Mammography screening results were categorized using the American College of Radiology Breast Imaging Reporting and Data System (American College of Radiology, 2003). Cervical cancer screening includes Papanicolaou (Pap) tests, which were categorized using the Bethesda System (American College of Obstetricians and Gynecologists, 2003; Kurman & Solomon, 1993).

Independent Variables

Six independent variables were included in multivariable models analyzing the diagnosis and treatment outcomes described above: client age, client race/ethnicity, program size, state, time, and the timing of screening relative to implementation of the Treatment Act. Client age was measured as a continuous variable reflecting age at the time of screening. Race and ethnicity were coded as indicator (dummy) variables including White, Black, Hispanic, Asian, Native American (including American Indian and Alaska Native), and Other. Program size was included as a control variable, measured as the number of clients (in thousands) seen by a program in a given year. We also included dummy

variables for the 50 states and the District of Columbia to control for differences across states. To capture any underlying time trends, time was measured in months over the 11-year period ($n = 132$ months).

The main independent variable in the analyses was the timing of Treatment Act implementation across programs. States were allowed the option to expand Medicaid eligibility for women diagnosed through the NBCCEDP beginning in October, 2000. By the end of the time period for which we have data (December 31, 2005), all 50 states and the District of Columbia had implemented the Treatment Act. There was variation in the timing of the implementation of the Treatment Act, with 30 states implementing their Medicaid expansions in 2001, 18 in 2002, and one each in 2003, 2004, and 2005. Out of the 20 quarters from 2001 to 2005, 11 had one or more states implementing the expansion. Using exact dates, we created a dichotomous indicator variable for each screening record that signaled whether the screening took place before or after the Treatment Act was implemented in the state.

Analysis

This study utilized pooled cross-sections to perform a multiple time-series analysis of the impact of the Treatment Act on the various dependent variables under study. Although there is no classic control group for comparative purposes, having multiple groups ($n = 51$) with variation in the timing of the policy change creates a natural experiment in which a selected set of dependent variables are compared before and after implementation of the Treatment Act both within and across states (Jones 2000; Hosmer & Lemeshow, 2000).

Analyses were somewhat complicated by the fact that diagnosis and treatment times for women in a state are likely to be correlated from year to year. In addition to within-state correlation across time, approximately 10% of the women screened for cervical cancer and 25% of women screened for breast cancer were seen multiple times during the time period of the study. The vast majority of repeat patients were seen only twice, but in a few instances the same woman was screened up to six times. For these reasons, the standard regression assumption of independence among observations is likely to be violated. To remedy this problem, we used state fixed-effects regressions with clustered standard errors in our analysis. The results reported here are clustered at the state level, but other specifications were run to control for within-observation correlation. The results did not vary across different specifications of clustering. An additional benefit to using the fixed-effects approach is that it can help to account for likely unobserved heterogeneity, time invariant differences, and other unobserved characteristics that vary across programs and are likely to impact the outcomes of interest (Diggle, Liang, & Zeger, 1994; Wooldridge, 2001).

Two types of fixed-effect regression analysis were conducted for the continuous and binary dependent variables under study. The continuous time-to-diagnosis and time-to-treatment variables had highly skewed distributions, so ordinary least-squares (OLS) regression analyses of these continuous variables were conducted using log time (day) variables. Because the dependent variable is logged, the resulting coefficients from the regression models are interpretable as the percent change in Y (the dependent variable) for a unit change in X (the independent variables, including the Treatment Act; Jones, 2000; Manning & Mullahy, 2001) For the binary quality benchmark dependent variables (definitive diagnosis and treatment occurring within a specified number of days), linear probability models were employed. Linear probability models are used with binary outcome variables, predicting the probability of an event occurring (e.g., starting cancer treatment within 60 days of diagnosis), under the assumption that the effects of the independent variables on these probabilities are linear (Ai & Norton, 2003; Powers & Xie, 1999). Both the OLS and linear probability models were run for the full samples controlling for race and ethnicity. In addition, analyses stratified by race/ethnicity for the groups with sufficient sample sizes (White, Black, and Hispanic women) were conducted to see if the impact of the Treatment Act varied across subgroups.

Results

Descriptive Results

The sample consisted of 45,531 NBCCEDP clients with abnormal cervical screening results and 606,703 with abnormal breast screening results. The characteristics of clients with abnormal screening results before (1995–2000) and after (2001–2005) the policy changes were compared. Although there were no dramatic shifts in client characteristics in the two time periods, there were a few significant differences (Table 1). For example, the proportion of cervical cancer screening clients with abnormal results who were Black decreased over time, and the proportion of breast cancer screening clients who were Hispanic and Asian increased over time. In addition, the descriptive results suggest that women with abnormal breast screening results were on average older than women with abnormal Pap test results, a difference that reflects age differences in the incidence of these diseases and in age guidelines for breast versus cervical cancer screening.

Figure 1 shows the unadjusted trends (1995–2005) for the mean days to definitive diagnosis and treatment initiation for those with abnormal cervical screening tests, and the percent of cervical screening clients achieving definitive diagnosis and treatment initiation within 60 days. The mean time to a cervical definitive diagnosis did not change much over the time period,

Table 1. Sample Characteristics of Women Screened Through NBCCEDP With Abnormal Results Needing Follow-Up, 1995–2005

	Cervical Screening			Breast Screening		
Variable	Total ($N = 45,531$)	1995–2000 ($n = 17,562$)	2001–2005 ($n = 27,969$)	Total ($n = 606,703$)	1995–2000 ($n = 215,977$)	2001–2005 ($n = 390,726$)
Mean age (y)	36.4	36.1	36.5*	49.4	50.2	49.0*
Ethnicity (%)						
White	61.1	60.7	61.3	51.5	56.6	48.6*
Black	11.1	11.9	10.6*	14.2	14.4	14.1*
Hispanic	22.6	22.4	22.7*	26.4	21.6	29.0*
Asian	2.0	1.7	2.2	3.9	2.9	4.5*
Native American	1.2	1.3	1.2	1.6	2.4	1.2*
Other	2.1	2.0	2.1	2.4	2.0	2.4

*$p < .05$ between the 2 time periods.

with means of 66.8 days in 1995 and 65.3 days in 2005. The mean time to treatment initiation after a cervical diagnosis increased from 38.5 days in 1995 to 42.9 days in 2002, but then decreased to 35.0 days in 2005 (Figure 1A). The proportion of cervical screening clients meeting quality benchmarks also did not change much between 1995 and 2005 (Figure 1B), with the proportion receiving definitive diagnosis within 60 days ranging between 50% and 57% and the proportion initiating treatment within 60 days ranging between 70% and 75% across the years under study.

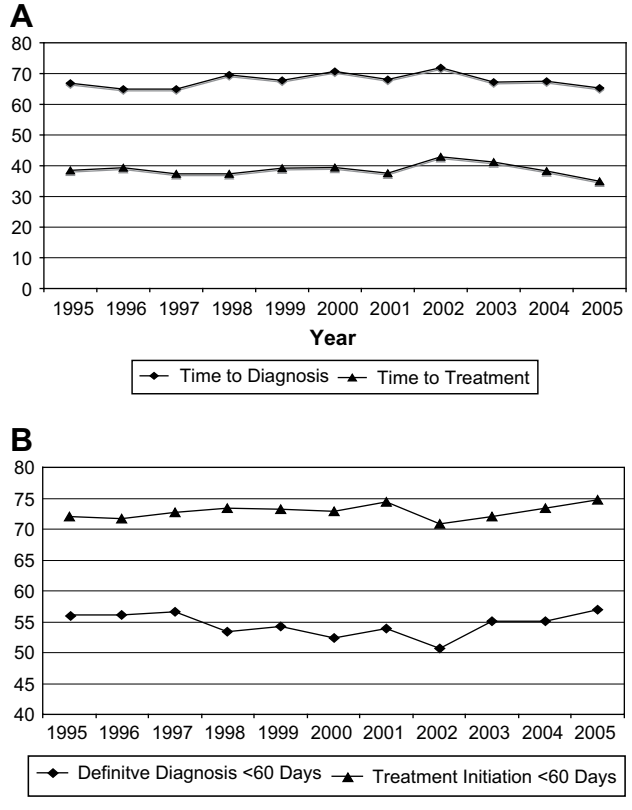

Figure 1. A. Mean time (in days) to definitive diagnosis and treatment initiation for cervical cancer screening clients, NBCCEDP, 1995–2005. **B.** Percent of cervical screening clients receiving definitive diagnosis and treatment initiation within quality benchmarks, NBCCEDP, 1995–2005.

Figure 2 shows the unadjusted trends (1995–2005) for the mean days to definitive diagnosis and to treatment initiation for those with abnormal mammograms, and the percent of breast screening clients achieving definitive diagnosis and treatment initiation within 60 days. The mean time to a definitive breast cancer diagnosis decreased from a high of 54.1 days in 1995 to 36.4 days in 2005; however, the mean time to treatment initiation remained fairly stable over the time period, starting with a mean of 20.3 days in 1995 and ending with a mean of 22.4 days in 2005 (Figure 2A). The decrease in the mean time to definitive breast diagnosis translated into an increase in the proportion of women meeting the 60-day quality benchmark for this outcome, increasing from 62% in 1995 to 77% in 2005, with a leveling off of this trend after 2000 (Figure 2B). The percent of breast cancer patients initiating treatment within 60 days remained fairly constant over the time period, ranging between 89% and 93% (Figure 2B).

Impact of the Treatment Act on Mean Days to Definitive Diagnosis and Treatment

Multiple time-series analysis was employed to see if the timing of the Medicaid expansion for cancer care in a state was associated with a significant change in the timing of definitive diagnosis or treatment initiation, net of the underlying trends taking place over the time period of the study. Multivariate OLS regression results revealed that, for the total population of NBCCEDP clients, the Treatment Act did not have a significant impact on the mean number of days between an abnormal screening test and definitive diagnosis for breast or cervical cancers (results not shown). The results also revealed that the Treatment Act did not have a significant impact on the timing of treatment initiation for breast cancer for the total sample (Table 2).

However, the OLS results suggested that the Treatment Act actually led to a significant increase in mean number of days between definitive diagnosis

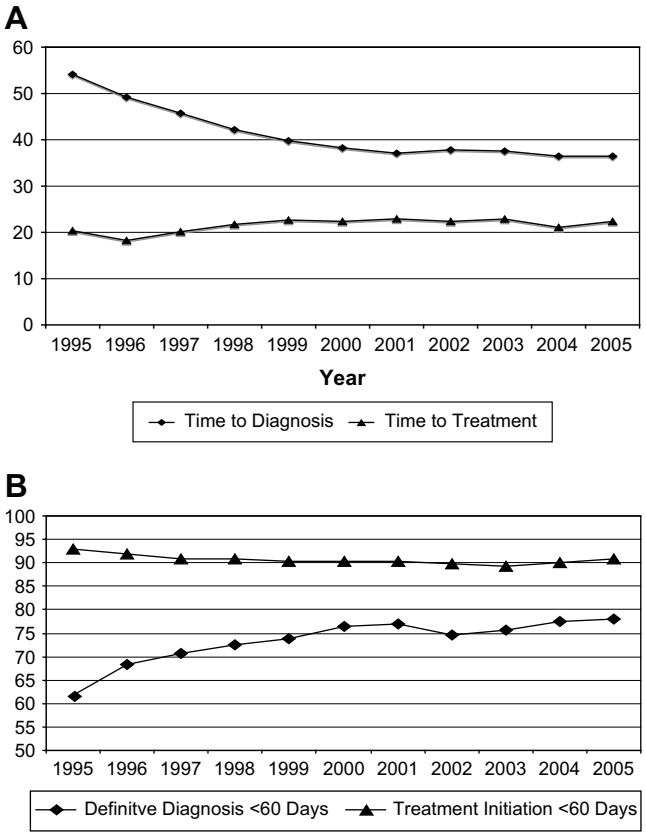

Figure 2. A. Mean time (in days) to definitive diagnosis and treatment initiation for breast cancer screening clients, NBCCEDP, 1995–2005. **B.** Percent of breast cancer screening clients receiving definitive diagnosis and treatment initiation within quality benchmarks, NBCCEDP, 1995–2003.

and treatment initiation for cervical precancer/cancer. In a model controlling for client age, race/ethnicity, size of the state program, and trends in the timing of treatment initiation, the Treatment Act was associated with a 31.1% increase (95% CI, 7.7%–54.5%) in the average number of days between a definitive diagnosis of cervical precancer/cancer and the start of treatment (Table 2). The percent increase in mean time to cervical treatment owing to the Treatment Act was 23.8% (95% CI, 3.8%–43.9%) between 2000 and 2003 and 40.4% (95% CI, 12.5%–68.3%) between 2004 and 2005, which suggests that the observed significant increase in time was not something associated with the early, phasing in of the Treatment Act in state Medicaid programs.

Table 2. Percent Change in Mean Days to Outcome Owing to the Treatment Act by Race/Ethnicity, National Breast and Cervical Cancer Early Detection Program, 1995–2005

Outcome	All Women	White	Black	Hispanic
Cervical screening				
Mean time to definitive diagnosis	−7.5%	−12.8%**	−7.7%	−3.4%
Mean time to treatment initiation	31.1%**	23.0%	60.6%***	39.3%***
Breast screening				
Mean time to definitive diagnosis	6.4%	8.2%**	5.2%	15.1%
Mean time to treatment initiation	7.7%	7.0%	8.4%	−2.3%

Models control for age, state, size of the program and time trend; the model for "all women" includes controls for race/ethnicity.
*$p < .05$.
**$p < .01$.
***$p < .001$.

The OLS regression results also revealed that the impact of the Treatment Act on the average time to definitive diagnosis and treatment varied by race/ethnicity. Also shown in Table 2, OLS results stratified by race/ethnicity suggested that the timing of the Treatment Act across states was associated with a significant decrease in the mean days to definitive cervical diagnosis for White women, but not for Black or Hispanic women (Table 2). This decrease ranged from four to six days across age groups among White women. The stratified results also revealed that the significant increase in the average number of days between a diagnosis of cervical precancer/cancer and treatment initiation was observed for Black women (60.6% increase) and Hispanic women (39.3%); the observed increase for White women (23.0%) was not significant (Table 2). The estimated increase in the days between cervical diagnosis and treatment varied by age in addition to race/ethnicity. Overall, the Treatment Act

seems to have increased the length of time between cervical diagnosis and treatment initiation by between seven and 15 days across age and racial/ethnic subgroups.

The Treatment Act also led to a significant increase (8.2%) in the mean number of days between an abnormal mammogram and definitive diagnosis for White women (Table 2). This increase ranged from two to three days across age groups. The Treatment Act was not associated with significant changes in the average time to treatment initiation for breast cancer among White, Black, or Hispanic women (Table 2).

Impact of the Treatment Act on CDC Quality Benchmarks

Cervical cancer. Linear probability regression analysis was used to identify covariates—including the timing of the Treatment Act—associated with receiving care within specific quality benchmarks across states. The results for cervical cancer screening (Table 3) revealed that the Treatment Act was not significantly associated with receiving a definitive diagnosis or initiating treatment within specific benchmarks, taking into account overall time trends. That is, the Treatment Act does not seem to have changed the probability that a woman with an abnormal Pap test received definitive diagnosis within 60 days, or that women diagnosed with cervical dysplasia or cervical cancer initiated treatment within 60 days. Thus, even though the Treatment Act was associated with an increase in the mean number of days between a cervical diagnosis and treatment initiation (as described), this increase did not have a negative impact on the proportion of cases meeting the quality benchmark of cervical treatment initiation within 60 days for the full sample. However, when analyses were stratified by race/ethnicity, the results revealed that Treatment Act was associated with a significant 9.4% decrease in the probability that Black women would initiate treatment within 60 days of a cervical diagnosis (predicted probability, −0.94; 95% CI, −0.178 to −0.01).

In addition, the results reveal significant racial/ethnic disparities in the timing of diagnosis and treatment across the entire time period of the study, both before and after the Treatment Act. Compared with White women, Hispanic, Black, Native American, and "Other" women had significantly lower predicted probabilities of being diagnosed and/or initiating cervical treatment within the benchmarks. The results presented in Table 3 are the difference in the probability of a meeting a quality benchmark compared to the referent group of White women (who have a predicted probability of 1.00). These results show that Black women were about 10% less likely than White women to receive a definitive cervical diagnosis within 60 days (predicted probability, −0.102), and about 5% less likely to initiate treatment within 60 days (predicted probability, −0.0479). Furthermore, the predicted probability results showed that Hispanic women with invasive cervical cancer were 12% less likely than White women to initiate treatment within 60 days of diagnosis (predicted probability, −.123).

Table 3. Cervical Cancer Screening in the NBCCEDP—Linear Probability Regression Results: Predicted Probabilities and 95% Confidence Intervals Regarding Quality Benchmarks, 1995–2005

Variable	Received Diagnosis <60 Days	Initiated Treatment < 60 Days (All Cases)	Initiated Treatment <60 Days (Invasive)
Race			
White—referent group	1.00	1.00	1.00
Asian	−0.0216	−0.0273	−0.0272
	(−0.0595 to 0.0162)	(−0.0703 to 0.0157)	(−0.121 to 0.067)
Other race	−0.0608***	−0.00689	0.0186
	(−0.0915 to −0.0300)	(−0.0368 to 0.0230)	(−0.112 to 0.149)
Hispanic	−0.0611***	−0.0248**	−0.123***
	(−0.0896 to −0.0327)	(−0.0470 to −0.0026)	(−0.185 to −0.060)
Black	−0.102***	−0.0479***	−0.0272
	(−0.121 to −0.083)	(−0.0700 to −0.0258)	(−0.0869 to 0.0325)
American Indian	−0.0751***	−0.0185	0.0379
	(−0.128 to −0.022)	(−0.0792 to 0.0421)	(−0.116 to 0.192)
Treatment Act	0.0343	−0.0449	−0.00594
	(−0.0313 to 0.1000)	(−0.116 to 0.026)	(−0.128 to 0.116)
No. of clients/year (thousands)	−0.00258**	0.00184	0.00412**
	(−0.00470 to −0.00046)	(−0.00129 to 0.00496)	(0.000104 to 0.008142)
Observations	50,856	28,248	1,482
No. of programs	51	51	50

All models control for age.
Robust 95% CIs in parentheses.
*p < .05.
**p < .01.
***p < .001.

Breast cancer. The linear probability regression results for breast cancer screening (Table 4) suggested that the Treatment Act had no impact on the probability of receiving a definitive breast diagnosis within 60 days or on initiating breast cancer treatment within 30 or 60 days after diagnosis. This means that, controlling for underlying trends, the timing of the Treatment Act did not have a significant impact on the probability that a woman with an abnormal mammogram would receive a definitive diagnosis or, if diagnosed with cancer, initiate treatment within quality benchmarks. This finding held across analyses stratified by race/ethnicity (results not shown).

The breast cancer results also indicated that there were significant racial/ethnic differences in the probability of receiving needed care within specific benchmarks both before and after the Treatment Act (Table 4). Compared with White women, those in all other racial/ethnic groups were significantly less likely to receive a definitive diagnosis within 60 days; and Hispanic, Black, and Native American (but not Asian) women were significantly less likely to start treatment for breast cancer within 30 or 60 days. For example, relative to White women, the predicted probability of receiving a definitive breast diagnosis within 60 days was 9% lower for Black women (predicted probability, −0.09) and about 8% lower for Native American women (predicted probability, −0.0777). In terms of treatment initiation, Black women were approximately 7% less likely to start their breast cancer treatment within 30 days than White women (predicted probability, −0.0662).

Discussion

This study sought to identify the impact of a Medicaid expansion for cancer care on the timing and receipt of diagnostic and treatment services among low-income women participating in a national cancer screening program. The Breast and Cervical Cancer Prevention and Treatment Act was a policy strategy that was approved by Congress in 2000 and rolled out across states at varying times. In regard to breast cancer, the timing of the Treatment Act across states was associated with a slight increase in the average number of days between an abnormal mammogram and definitive diagnosis for White women, but it was not associated with a change in the proportion of women who initiated breast cancer treatment within 30 or 60 days after diagnosis. An additional finding, however, is that NBCCEDP clients from racial/ethnic minority groups were significantly less likely than White women to receive a definitive diagnosis or to initiate breast cancer treatment within specified quality benchmarks over the entire time period of this analysis.

For cervical screening clients, the Treatment Act had the following significant impacts: 1) it reduced the mean time to definitive diagnosis for White women; 2) it increased the mean time to treatment initiation for the full sample because of large increases in the average timing of treatment for Black and Hispanic women; and 3) the increase in the average number of days between diagnosis and treatment did not impact quality benchmarks, except in the case of Black women, who experienced a significant reduction

Table 4. Breast Cancer Screening in the NBCCEDP—Linear Probability Regression Results: Predicted Probabilities and 95% Confidence Intervals Regarding Quality Benchmarks, 1995–2005

	Received Diagnosis <60 Days	Initiated Treatment <30 Days	Initiated Treatment <60 Days
Race			
White–referent group	1.00	1.00	1.00
Asian	−0.0802***	−0.0164	−0.00442
	(−0.120 to −0.041)	(−0.0513 to 0.0185)	(−0.0158 to 0.0070)
Native American	−0.0777***	−0.0455*	−0.0396*
	(−0.0969 to −0.0585)	(−0.0913 to 0.0002)	(−0.0823 to 0.0031)
Hispanic	−0.0826***	−0.0264***	−0.0140*
	(−0.116 to −0.049)	(−0.0445 to −0.0084)	(−0.0286 to 0.0007)
Black	−0.0908***	−0.0662***	−0.0423***
	(−0.116 to −0.066)	(−0.102 to −0.030)	(−0.0616 to −0.0231)
Other race	−0.0817***	−0.0279	−0.00735
	(−0.107 to −0.056)	(−0.0644 to 0.0085)	(−0.0238 to 0.0091)
Treatment Act	−0.00403	−0.0189	−0.00587
	(−0.0422 to 0.0341)	(−0.0602 to 0.0225)	(−0.0264 to 0.0146)
No. of clients/year (thousands)	−0.00129***	0.000481***	−0.000155*
	(−0.00156 to −0.00102)	(0.000131 to 0.000830)	(−0.000337 to 0.000027)
Observations	664,580	29,285	29,285
No. of programs	51	51	51

All models control for age.
Robust 95% CIs in parentheses.
**p < .01.
*$p < .05$.
***$p < .001$.

(9.4%) in the probability that they would initiate cervical treatment within 60 days of diagnosis. In addition, it was found that Black, Hispanic, and Native American clients were significantly less likely to receive a definitive cervical diagnosis or to initiate treatment within specified quality benchmarks both before and after the Treatment Act.

In summary, the Treatment Act of 2000 had some positive impacts, including a slight (one- to two-day) decrease in the average number of days to definitive cervical diagnosis for White women. Nonetheless, the Treatment Act also had some negative impacts on the timing of diagnosis and treatment services, including significant increases (7–15 days) for Hispanic and Black women in the average time between a cervical diagnosis and the initiation of treatment. The Treatment Act was also associated with a decrease in Black women initiating treatment within 60 days of a cervical diagnosis. As such, although the Treatment Act neither improved nor reduced the proportion of White and Hispanic clients who received definitive diagnosis or initiated cervical treatment within 60 days, it reduced the probability that Black women met the 60-day benchmark for treatment initiation.

The significant increases in the number of days between diagnosis and breast cancer treatment for White women, and between diagnosis and cervical dysplasia/cancer treatment for Black and Hispanic women, would not be clinically significant if these increases had no impact on the proportion receiving care within quality benchmarks. There are obvious trade-offs between having it take a bit more time to get enrolled in Medicaid and/or to find a provider who takes Medicaid patients, and having the costs of all treatment services and other health care needs covered in the end. As long as the increase in time remains within quality benchmarks, adding some days to the process is not necessarily a negative outcome. In the past, NBCCEDP clients and providers were facing serious obstacles to getting treatment financed for those diagnosed with cancer (CDC, 1998; Lantz et al., 2000). In fact, several providers reported that they limited the number of women they screened because of the burden of finding treatment resources for those with cancer (Lantz et al., 2000). Again, having the process take an extra bit of time should be balanced against other outcomes, such as the potential for preventing NBCCEDP clients from facing serious stress and financial hardship associated with treatment financing and for increasing in the number of providers and participants in the program.

Nonetheless, the fact that an increase in time to cervical treatment was only observed for Black and Hispanic women, and that it affected the achievement of quality benchmarks for Black women, is of great concern. These findings suggest that racial/ethnic disparities may exist in regard to access to gynecologists and other clinicians who treat cervical conditions and accept Medicaid patients. After the Treatment Act, NBCCEDP clients in need of cervical diagnostic and treatment services had to seek out providers who accepted Medicaid patients. It may be the case that Black and Hispanic women experienced greater difficulty in finding gynecologic service providers who accept Medicaid patients or could do so in a timely fashion after the Treatment Act was implemented in a state. Data to support this hypothesis are not available; and, in fact, even before the Treatment Act was implemented, NBCCEDP providers of cervical diagnostic/treatment services tended to serve low-income, minority clients who were on Medicaid (Saraiya et al., 2007). It may also be the case that Black and Hispanic women were more likely to experience delays in making and keeping appointments than White women after the Treatment Act. A Canadian study found that, even in a setting with financial access to colposcopy services, socioeconomically disadvantaged and immigrant women had high no-show rates (Ogilvie, Shaw, Lusk, Zazulak, Kaczorowski, 2004).

Nationally, the proportion of NBCCEDP clients initiating breast cancer treatment within 60 days ranged from 93.0% in 1995 to 91% in 2005. The Treatment Act did not have a significant impact on this rate. The proportion of women initiating cervical treatment within 60 days fluctuated very little over the time period of this study, ranging from 72% in 1995 to 75% in 2005. There is room for improvement in the proportion of NBCCEDP clients meeting quality benchmarks for cervical treatment initiation. Unfortunately, the Treatment Act did not have a significant impact on this.

In addition, a troubling finding is that women of color had longer times to definitive diagnosis after an abnormal screening test and to treatment initiation both before and after the Treatment Act was implemented. This is worrisome given that a stated goal of the program is to increase breast and cervical cancer screenings and reduce mortality among underserved women, minority women in particular (Henson et al., 1996). It is unclear whether these disparities reflect psychosocial factors that lead to delay in care seeking, if they reflect financial, logistical, or other types of barriers to health care access, and/or if they are in part the result of discrimination in health care settings. Further research regarding racial/ethnic disparities in breast and cervical cancer outcomes among NBCCEDP clients is of critical importance.

There are a number of important limitations to consider when interpreting the findings of this study. First, the finding that the Treatment Act is associated with an increase in the mean length of time between a cervical diagnosis and treatment initiation could in part be explained by the impact the Treatment Act had on the use of the NBCCEDP. The number of women screened through the NBCCEDP increased greatly over the time period of this study (CDC, 2007). With the implementation of the Treatment Act in a state, providers

were likely to be more willing to join the program or to take on more clients. In addition, with the newly available option for treatment coverage, more women may have been willing to participate in the screening program. If the Treatment Act did indeed cause a significant increase in the number of participating providers and the number of women getting screened, the increased volume could result in somewhat longer times to definitive diagnosis and treatment initiation. There is some evidence to support these hypotheses. Between 2001 and 2003, the number of women screened for cancer through the NBCCEDP jumped by nearly 40%, increasing from approximately 404,000 women in 2001 to 549,000 in 2003; the number in 2005 was even higher at 629,000 (CDC, 2007). Many more women sought out screening services; as a result, many more required diagnostic follow-up and treatment. It is also possible, however, that increased funding levels for the program after 2000 contributed to the rise in clients served.

Second, Miller (2007) reported that, although states did adopt the Medicaid expansion at a fairly rapid rate, the Federal dollars actually spent on the program in fiscal year 2001 amounted to $49,000 because only four rather small states (Connecticut, New Hampshire, Vermont, and West Virginia) had operational programs the first year. Although many more states came on board the following year, the program was still operating at a "minimal rate." By fiscal year 2005, the majority of states had implemented programs that were serving clients, and federal program expenditures rose to $209 million. Thus, we were looking for an effect of the Treatment Act during a time period when the state Medicaid expansions were initially being designed, approved, and then implemented, and expenditures were low.

Despite the limitations of this study, the results do shed light on the impact of a relatively unusual policy response (a disease-specific Medicaid expansion) in a major federally funded public health program in the United States. The Treatment Act of 2000 was a unique policy move, offering a disease-specific expansion of Medicaid to women screened through a federal program. Support for this expansion was predicated on a framing of the NBCCEDP as an "unethical" public health program because it did not cover the costs for treatment for women diagnosed through the program (Lantz et al. 2003; Weisman, 2000). Given that screening without funding for treatment is a common public health practice, the results from this impact analysis of the Treatment Act may provide useful information for discussions of other Medicaid expansions for government disease screening/testing programs.

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References

Ai, C., & Norton, E. C. (2003). Interaction terms in logit and probit models. *Economics Letters*, 80, 123–129.

American College of Obstetricians and Gynecologists (AGOC). (2003). Clinical management guidelines for obstetricians-gynecologists. *ACOG Practice Bulletin*, 45, 1–11.

American College of Radiology (ACR). (2003). *Breast imaging reporting and data system (BI-RADS) atlas*. Reston, VA: American College of Radiology.

Campbell, D. T., & Stanley, J. C. (1996). *Experimental and quasi-experimental designs for research*. Boston: Houghton Mifflin Company.

Centers for Disease Control and Prevention (CDC). (1998). Strategies for providing follow-up and treatment services in the National Breast and Cervical Cancer Early Detection Program—United States, 1997. *Morbidity and Mortality Weekly Report*, 47, 215–218.

Centers for Disease Control and Prevention (CDC). National breast and cervical cancer early detection program. Screening Program Data. National Aggregate. Available: http://www.cdc.gov/cancer/nbccedp/data/summaries/national_aggregate.htm. Accessed February 8, 2009.

Cochran, C. R., Moseleve, C. B., & Peltier, J. W. (2004). Quality improvement in a federally funded community breast and cervical cancer screening program. *Journal of Health and Human Services Administration*, 27, 12–33.

Diggle, P.J., Liang, K.Y., & Zeger, S.L. *Analysis of longitudinal data.* New York: Oxford University Press.

French, C., True, S., McIntyre, R., Sciulli, M., & Maloy, K. A. (2004). State implementation of the Breast and Cervical Cancer Prevention and Treatment Act of 2000: A collaborative effort among government agencies. *Public Health Reports*, 119, 279–285.

Henson, R. M., Wyatt, S. W., & Lee, N. C. (1996). The National Breast and Cervical Cancer Early Detection Program: A comprehensive public health response to two major health issues for women. *Journal of Public Health Management and Practice*, 2, 36–47.

Hosmer, D. W., & Lemeshow, S. (2000). *Applied logistic regression* (2nd ed.). New York: John Wiley & Sons, Inc.

Jones, A. (2000). Health econometrics. In A. Culyer, & J. Newhouse (Eds.), *Handbook of health economics*. Amsterdam: Elsevier.

Kurman, R. J., & Solomon, D. (1993). *The Bethesda system for reporting cervical/vaginal cytologic diagnoses*. New York: Springer-Verlag.

Lantz, P. M., Keeton, K., Romano, L., & Degroff, A. (2004). Case management in public health screening programs: The experience of the National Breast and Cervical Cancer Early Detection Program. *Journal of Public Health Management and Practice*, 10, 545–555.

Lantz, P. M., Richardson, L. C., Sever, L. E., Mackelm, D. J., Hare, M. L., Orians, C. E., et al. (2000). Mass screening in low-income populations: Challenges in securing diagnostic and treatment services in a national cancer screening program. *Journal of Health Politics, Policy and Law*, 25, 451–471.

Lantz, P. M., Weisman, C. S., & Itani, Z. (2003). A sociopolitical analysis of a disease-specific expansion of Medicaid: The Breast and Cervical Cancer Prevention and Treatment Act of 2000. *Women's Health Issues*, 13, 79–92.

Manning, W., & Mullahy, J. (2001). Estimating log models: To transform or not to transform? *Journal of Health Economics*, 20, 461–494.

Miller, V. (2007, January 11). *Update on Medicaid breast and cervical cancer treatment*. Issue Brief: 07-02. Washington, DC: Federal Funds Information for States.

Ogilvie, G. S., Shaw, E. A., Lusk, S. P., Zazulak, J., & Kaczorowski, J. A. (2004). Access to colposcopy services for high-risk Canadian women: Can we do better? *Canadian Journal of Public Health*, 95, 346–351.

Powers, D., & Xie, Y. (1999). *Statistical methods for categorical data analysis*. San Diego: Academic Press.

Saraiya, M., Irwin, K. L., Cartin, L., Chen, X., Jain, N., Bernard, V., et al. (2007). Cervical cancer screening and management practices among providers in the National Breast and Cervical Cancer Early Detection Program. *Cancer*, 110, 1024–1032.

Weisman, C. S. (2000). Breast cancer policymaking. In A. S. Kasper, & S. J. Fegurson (Eds.), *Breast cancer: The social construction of an illness* (pp. 213–244). New York: St. Martin's Press.

Wooldridge, J. M. (2001). *Econometric analysis of cross section and panel data*. Cambridge, MA: MIT Press.

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