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Effects of State Cervical Cancer Insurance Mandates on Pap Test Rates

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ABSTRACT

Cervical cancer is one of the most preventable, treatable, and survivable cancers, and Pap tests (the standard screenings for cervical cancer) are recommended for nearly all adult women. We provide the first evidence on the effects of mandates adopted by 24 states from 1988 to 2000 that require insurance plans to cover Pap tests. In difference-in-differences models using data on 600,000 women age 19-64 from the CDC's Behavioral Risk Factor Surveillance System, we find that these mandates significantly increased past two-year cervical cancer screenings by 1.3 percentage points, with larger effects for Hispanic and non-Hispanic white women. These effects are plausibly concentrated among insured women and are not observed for other women's health behaviors (e.g., mammograms). Our results suggest that mandating more generous insurance coverage for even cheap, routine services with already high utilization rates such as Pap tests can significantly further increase utilization. Our results also suggest that federal health reform should further increase Pap test rates.

JEL classification: I1, K32

Keywords: insurance mandates, cervical cancer screenings, Pap tests, quasi-experiment

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1. Introduction

Recently adopted federal health reform (the Patient Protection and Affordable Care Act) requires that all new or substantially revised insurance plans cover Pap tests, which are the standard screening for cervical cancer.[1] This coverage is linked to the fact that the United States Preventive Services Task Force (USPSTF) strongly supports the efficacy of Pap tests, giving them a grade of 'A', above that of mammograms (which are the standard screenings for breast cancer). This grade reflects scientific consensus that cervical cancer is one of the most preventable, treatable, and survivable cancers, and early detection through Pap tests is very important to increase cancer survival.

In this paper we provide the first quasi-experimental evidence on the effects of very similar reforms adopted at different times by 24 states from 1988-2000 that require private insurance plans to cover (or, less commonly, offer) Pap tests. We draw on data with outcomes on Pap test use for slightly more than 600,000 women from the 1988-2000 Behavioral Risk Factor Surveillance System (BRFSS), a publicly available dataset that is designed to be representative at the state level in each year. These data have included questions about cervical cancer screenings since 1988, and they also include standard demographic characteristics and a summary measure of health insurance coverage (since 1991). The empirical approach takes advantage of the staggered timing of adoption of the mandates across states in a difference-in-differences (DD) framework with state and year fixed effects. We also control for individual-level characteristics (e.g., age, race, education, and marital status) and annual state economic and demographic characteristics.

To preview, we provide the literature's first evidence that state cervical cancer screening mandates significantly increased Pap test utilization: DD estimates indicate that

a mandate for annual screening significantly increased the probability a woman aged 19-64 reports having had a Pap test in the past 2 years by 1.3 percentage points, with larger effects for Hispanic and non-Hispanic white women. These effects are robust to inclusion of controls for other aspects of the cervical cancer screening environment, are not observed for other women's health outcomes such as mammography screenings that were not targeted by these particular mandates, and are plausibly concentrated among insured individuals. Our results confirm that more generous insurance coverage for even cheap, routine in-office services with already high utilization rates can significantly further increase utilization. Recently adopted federal health reform, which requires insurance plans to cover preventive services such as Pap tests, may be expected to further increase cervical cancer screening rates toward recommended levels.

The paper proceeds as follows: Section 2 provides institutional background and a brief literature review. Section 3 describes the data and empirical approach. Section 4 presents the main results, and Section 5 concludes.

2. Institutional Details and Relevant Literature

2.1 Institutional Details

Cervical cancer is the fifth most deadly cancer worldwide. Early detection through regular Papanicolaou ('Pap') tests is commonly understood in the medical community to be the most important determinant of survival. The Papanicolaou test (henceforth "Pap test", sometimes also called "Pap smear", "cervical smear", or "cervical test") is the standard method for detecting early cancer of the cervix. In a Pap test, a tool is used to gather cells from the outer opening of the cervix. These cells are examined under a

[1] The provision also prohibits plans from charging copays or deductibles for Pap tests.

microscope for abnormalities, particularly for pre-cancerous changes usually caused by the human papillomaviruses which are sexually transmitted. If the test is abnormal, colposcopy (a cervical examination using a microscope) or a biopsy can follow. Pap tests are generally given as part of a comprehensive pelvic examination performed by a woman's obstetrician/gynecologist (OB/GYN). They are also commonly performed at women's health clinics when a woman seeks contraception or is treated for a sexually transmitted infection (STI).

Unlike screenings for other major cancers such as breast, prostate, and colon cancer, cervical cancer screening tests have very high utilization rates. Our public health data, which we describe in detail below, show that well over 80 percent of women age 19-64 reported that they had a Pap test in the past two years as early as 1988 – the first year of our sample. Although the goal of major medical organizations and Healthy People 2020 is to reach cervical cancer screening rates of 90% for adult women, Pap test rates are (and for a long time have been) considerably higher than mammography, proctoscopy, and colonoscopy rates. Differential utilization rates may be explained in part by differences in cost and in convenience. For example, the average cost of a Pap test is $25-$40. This is much cheaper than the average cost for a screening mammogram ($80-$210) or for a colonoscopy ($3000).[2] Pap tests are also frequently performed in-office as part of a standard well-woman exam; in contrast, mammograms and colonoscopies require special equipment and often are performed during another visit to a separate facility upon referral.

[2] See, for example: http://www.costhelper.com/cost/health/colonoscopy.html and http://www.costhelper.com/cost/health/mammogram.html.

Twenty four states adopted mandates requiring qualified private health insurance plans to cover (or, less commonly, offer) Pap tests from 1988 to 2000.[3] These mandates apply to the insurance companies who sell insurance to private employers (or, in some cases, sell to individuals). Women who have their own employer-related private insurance coverage or who have insurance through employed husbands or others would be affected by these mandates if the firm was not self-insured.

2.2 Relevant Literature

Our paper is related to a large literature in economics that has used experimental and quasi-experimental methods to identify causal effects of insurance coverage and insurance generosity on use of health services and health outcomes, such as the RAND Health Insurance Experiment (HIE) (Manning et al. 1987), the Oregon Health Insurance Experiment (Finkelstein et al. 2012), and the Massachusetts Health Reform (Kolstad and Kowalski, 2010), all of which examined Pap tests as a key preventive health care outcome. The results of those studies are mixed. Manning et al. (1987) found that cost-sharing deterred participants from obtaining preventive care relative to the 'free' plan in the controlled setting of the RAND HIE from 1971 to 1982. Lurie et al. (1987), however, found no difference between screening rates for people in the 'free' plan versus people randomized to cost-sharing. Finkelstein et al. (2012) study low-income Medicaid-eligible women and find that participants who took-up Medicaid in the state due to winning a lottery in 2008 (i.e., generally moved from no insurance to public insurance) were significantly more likely to get a Pap test in the first year after the program, an effect on the order of 45 percent relative to the control group mean. Notably, there was no cost-

[3] Cover mandates require privately sold plans to include coverage of Pap tests while offer mandates only require that insurers offer at least one such plan to an employer. In practice, the bulk of our results pertain

sharing for participants in the Oregon plan. In contrast, Kolstad and Kowalski (2010) find no significant change in Pap test use for women in Massachusetts relative to women in other states after the implementation of the state's mandated health insurance reform in 2006. Thus, the existing quasi-experimental evidence on the role of insurance coverage in Pap test use is mixed. We complement these studies by examining a different type of insurance-related intervention that specifically targets Pap tests.

We are aware of no studies that examine the effects of state insurance benefit mandates requiring coverage of Pap tests. The absence of a substantial literature on the utilization effects of Pap test mandates is striking given that Pap tests are one of the most commonly mandated benefits (Bunce and Wieske 2008). Moreover, other types of state level insurance benefit mandates have been studied extensively by economists. These include: mammography screenings (Bitler and Carpenter 2014a), pregnancy benefits, (Gruber 1994a), infertility treatment (e.g., Bitler 2010; Bitler and Schmidt 2012; Schmidt 2007; Bundorf, Henne, and Baker 2007; Buckles 2008), mental health parity (e.g., Pacula and Sturm 2000; Harris, Carpenter, and Bao 2007; Busch and Barry 2008), and overnight hospital stays for newborn deliveries (e.g., Liu, Dow, and Norton 2004; Almond and Doyle 2011).

Researchers have identified a number of considerations for understanding the extent to which any mandated benefits laws should affect outcomes. First, it is commonly argued that mandated benefits laws can cause employers—particularly small firms—to reduce offers of health insurance in response to the rising costs when mandated benefits laws are adopted. While the empirical evidence on this is mixed (Gruber 1994b, Jensen and Gabel 1989, Jensen and Morrisey 1999, Sloan and Conover 1998), any such

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to cover mandates because they are far more common in our setting than are offer mandates.

effects would reduce the potential for benefit mandates to increase utilization. Second, as we noted above, certain insurance plans are exempted from compliance requirements with any state health insurance mandates. The largest of these is the exemption because of ERISA for self-funded insurance plans which generally affects large employers (Buchmueller et al. 2007), though there is very little evidence on how self-insured firms respond to state insurance mandates.[4] Butler (2000) estimates that about a third of women have private insurance that would potentially be affected by mandates such as those we study here.

Third, it is possible that benefits mandates do not have much "bite" to the extent that pre-existing private health insurance plans were already covering or offering Pap tests. However, available evidence indicates that benefits coverage for these services did not become widespread until the mid-1990s, implying that there was substantial latitude for Pap test mandates to affect benefits coverage. Sullivan and Rice (1991), for example, report that the Health Insurance Association of America (HIAA) employer benefits survey fielded in 1990 showed that only about 67 percent of private plans were covering Pap tests in 1990. By 1999 the Kaiser/HRET Survey of Employer-Sponsored Health Benefits found that 94 percent of conventional plans and 98 percent of HMO plans were covering mammography screening (the most closely related benefit to Pap tests, which the survey stopped asking about), suggesting a large increase in coverage over a period of significant mandate adoption (Kaiser/HRET 1999).

[4] A recent piece of indirect evidence suggesting the importance of the ERISA exemption is Akosa Antwi, Moriya, and Simon (2013) who find that state policies (from which ERISA plans are exempted from compliance requirements) had smaller effects than federal policies (from which ERISA plans are not exempted from compliance requirements).

It is, of course, natural to ask, given the fairly low cost of Pap tests, why weren't all employers and health plans covering these screenings even in the absence of a mandate? Note that although the cost of an individual screening is relatively cheap, the population at risk of using a mandate is very large: all women over age 18 were recommended to get annual Pap tests over the bulk of our sample period. In contrast, most benefits mandates that have been studied previously (e.g., in-vitro fertilization, substance use/alcoholism treatment) have the potential to affect a much smaller portion of the population. Those other benefits are also typically for services that are far less frequent and regular than Pap tests. Finally, even though the costs of the actual screening are low, the subsequent costs associated with biopsy and other cancer treatments are much larger.

3. Data Description and Empirical Approach

3.1 Data Description

Our main outcome data come from the Center for Disease Control's Behavioral Risk Factor Surveillance System (BRFSS). Fielded annually since 1984, the BRFSS has included questions about Pap tests in every year since 1988 and is designed to be representative at the state level. Surveys are fielded by the individual states and then sent to CDC to be compiled into a public-use dataset. Our analysis focuses on 1988 to 2000, which spans the period when 24 states adopted these laws.[5]

[5] State participation in the BRFSS increased over the late 1980s, and the last state joined the BRFSS in the mid 1990s. In practice, this means that we have an unbalanced panel; because many states adopted laws prior to 1990 we use all available data (i.e., any state/year combination with BRFSS data). Findings are robust to using a balanced panel. Texas and Maryland adopted laws after 2000. We stop our sample in 2000 because there was a federal law passed in 2000 regarding funding for cervical cancer treatments for low-income uninsured women – the Breast and Cervical Cancer Prevention and Treatment Act (BCCPTA). Specifically, the BCCPTA gives states the option to use their Medicaid programs to cover breast cancer

The BRFSS Pap test questions allow us to create consistent measures of utilization along several dimensions for women age 18 and older. Specifically, in 1988, women were asked: "Have you ever had a Pap smear?" Women who report ever having had a Pap test then asked about the timing of their most recent Pap test, as well as the reason for their most recent Pap test.[6] We create three key outcome variables: first, we identify Ever had Pap test as equal to one if the woman reports ever having had a Pap test and zero otherwise. Second, we create Pap test in the past year as equal to one if the woman reports that she had a Pap test within the past year and zero otherwise.[7] Third, we create Pap test in the past two years as equal to one if the woman reports that she had a Pap test within the past two years. Note that these latter two variables are not mutually exclusive: All observations where Pap test in the past year is 1 also have Pap test in the past two years equal to 1.[8]

We also observe standard demographic characteristics in the BRFSS, including age, race, education, marital status, family income (in ranges), and employment status.[9] The BRFSS also includes a very basic measure of health insurance coverage (beginning

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treatments for previously uninsured women who were screened through the National Breast and Cervical Cancer Early Detection Program (NBCCEDP). We control for state implementation of the NBCCEDP program in all specifications.

[6] Actual question wording changed very slightly from 1991 to 1992 and from 1992 to 1993. From 1988 until 1990 women were first asked if they have ever heard of a Pap smear. In 1991 women were first told that a Pap smear tests for cancer of the cervix or uterus before they were asked about whether they had heard of a Pap smear. In both cases, we code individuals who report never having heard of a Pap smear as never having had a Pap test. Starting in 1992 women were no longer asked whether they had heard of a Pap smear; instead, women were asked about lifetime cervical cancer screening after the interviewer first defined the procedure.

[7] Item non-response is low for these questions. We omit observations who responded 'don't know' or who refused a response to the Pap test questions.

[8] A problem is that we lack exact timing of the most recent Pap test (beyond first year, second year, or later). Moreover, any of the Pap test outcomes that measure recency of screening raise questions about recall bias, as well as whether the woman is reporting behavior within the previous calendar year or within the previous 365 days. Thus we use all of the measures to ensure our findings are robust, and we measure exposure to our key dependent variable – insurance mandate – using the same window over which the Pap test variables are measured.

in 1991): we are able to identify whether the woman is covered by "any health plan".[10] Since the state mandates we study should work primarily through the mechanism of increasing generosity of insurance coverage for Pap tests, the insurance variable - though imperfect - constitutes an important plausibility check on our results (i.e., any effects of mandates should be observed mainly in the sample of women with a health plan).

3.2 Empirical Approach

Our main empirical approach relies on variation in the timing of adoption of the Pap test mandates by estimating state- and year-level fixed effects models of outcomes. Since many unobserved factors contributing both to outcomes and to policy adoption are likely to be time invariant within a state (e.g., voters in some states have stronger unobserved preferences for women's health than other states), the two-way fixed effects models remove these sources of bias. Second, we observe state/year measures of some of the key variables which could be alternative explanations for increased cervical screenings such as managed care and HMO penetration, and we include these directly in the regression models (described below). We also account for other co-occurring aspects of the policy environment toward cervical cancer. In these augmented difference-in-differences models with controls for demographics, other policies, and fixed characteristics of states,

[9] We choose not to control directly for employment or household income in the regression models below due to their likely endogeneity with our outcomes and key variables of interest.

[10] We cannot distinguish the type of plan, however. One might be concerned that this "any health plan" measure is picking up some women who have Medicaid for example, and are not affected by the mandates. We have examined data from the March Current Population Surveys (CPS) over this same period to see what share of health care coverage is from private insurance. For women 25-64, approximately 90% of those with any health coverage in the CPS had private coverage. The share for most subgroups of interest is also at least 90% (e.g., high school graduates 25-64, women with some college 25-64, college graduates 25-64, and non-Hispanic white women 25-64). For non-Hispanic blacks and Hispanics 25-64, the relevant figure is above 75%. Even for high school dropouts 25-64, 65% of those with any health coverage had private coverage.

the key identifying assumption is that there were no other unobserved shocks to outcomes coincident with policy adoption that affected cervical cancer screening outcomes.

We implement the DD analysis using a standard OLS model of the form:

$$(1) \quad Y_{ist} = \beta_0 + \beta_1 X_{ist} + \beta_2 (\text{PAP TEST MANDATE})_{st} + \beta_3 Z_{st} + \beta_4 S_s + \beta_5 T_t + \varepsilon_{ist}$$

where Y_{ist} are the various dichotomous screening outcomes for woman *i* in state *s* at time *t*. X_{ist} is a vector of individual level demographic characteristics that includes: age group dummies (19-24, 30-34, 35-39, 40-44, 45-49, 50-54, 55-59, 60-64, 25-29 omitted), race/ethnicity (non-Hispanic black, non-Hispanic other race, Hispanic ethnicity, white non-Hispanic omitted) education (less than high school, high school degree, some college, DK/RF, college degree or more omitted), and marital status (never married, widowed/divorced/separated, cohabiting, DK/RF, married omitted). The key policy variable reflects the cervical cancer mandates, and β_2 is the coefficient of interest.[11] Note that our key policy variable for the one-year and two-year Pap outcomes is the share of

[11] There is a great deal of variation across states in the language regarding when the laws are supposed to take effect. Some states set a date after which "all policies sold or renewed after that date" must comply with the mandate, while others state that benefits must be changed effective immediately. We have coded plans as taking effect the year after the year in which they are passed, with the logic that most policies are renewed with insurers in January. Note also that the BRFSS questions introduce a "reference window" problem due to the fact that the questions typically ask about screening behavior over some recent period. Given this, it is important to account for the systematic BRFSS interview structure when defining someone as treated by the policy in question. Specifically, we make use of the fact that BRFSS interviews are distributed almost uniformly across the calendar year and we know which month the interview occurred in. This information, coupled with our decision rule regarding when individuals are first treated, means that we can create a more precise treatment variable that captures the share of the recent period that the individual was treated by the Pap test mandate. The intuition here is straightforward: since we define a policy to turn "on" in January 1 of the year following adoption, it remains the case that people interviewed in, say, February of what we define as the first treatment year will have only been exposed to two months of treatment while people interviewed in, say, November of that same year in that same state will have been exposed to 11 months of treatment. Similarly, for the past two year outcomes we code individuals interviewed in January after the adoption year as being treated 1/24, February of the adoption year as being treated 2/24, and so forth, until December of the following year (i.e., December in the second year after adoption) as being fully treated (i.e., 24/24). Note that even if our assumptions about when insurance policies reset are incorrect, it remains the case that people interviewed toward the beginning of the calendar year will, by construction, have less potential treatment than individuals interviewed toward the end of the calendar year in any period where there is variation in exposure.

that one- or two-year window that the policy was in effect; the ever Pap specifications use contemporaneous laws.

As noted above, we also include covariates that vary at the state and year level and that are standard in two-way fixed effects models such as ours. These variables are captured in Z_{st}, a vector of state economic and demographic characteristics, including: the unemployment rate, the HMO penetration rate, the number of obstetric beds in the state per 1000 women age 15-44, the share of women age 15-44 with private health insurance, the share of women age 15-44 who work (or whose spouses work) at private firms of various sizes (<24, 25-99, 100+), real median income for a family of 4, fraction black, fraction Hispanic, and fraction urban. The Z_{st} vector also includes controls for other relevant public policies that may be expected to affect insurance such as Medicaid expansions for pregnant women and welfare reform. This vector also controls for the presence of a state direct access law (Baker and Chan 2007),[12] state by year variation in the rollout of the federal cervical screening program for low-income uninsured women (NBECCDP),[13] and section 1115 Family Planning waivers to Medicaid which commonly covered Pap tests (Kearney and Levine 2009). Dummy variables for each state are captured by S_s, and in the DD models, control for time-invariant state-specific factors.

[12] Direct access laws require managed care organizations to allow women direct access to OB/GYNs without first obtaining a referral from her primary care provider (PCP). It has been hypothesized that requiring direct access may increase women's preventive health behaviors such as Pap tests. Baker and Chan (2007) also use BRFSS data from 1996 to 2000 to evaluate the effects of direct access laws and find no evidence that these laws increase Pap test rates. They do not, however, control for the presence of Pap test mandates.

[13] The Breast and Cervical Cancer Mortality Prevention Act of 1990 established federal funding for the National Breast and Cervical Cancer Early Detection Program (NBCCEDP). The mission of the NBCCEDP is to provide cancer screenings for low-income women within the state. NBCCEDP is a federal program, and states are required to submit plans to the federal government to receive federal funds. Adams et al. (2003) and Adams, Breen, and Joski (2006) use BRFSS data from 1996 to 2000 and find that the longevity of a state's participation in the NBCCEDP program is significantly associated with increases in Pap test rates for women under age 64 in models with state and year fixed effects. These studies do not,

Dummy variables for each survey year are captured by T_t, and in the DD specifications, control for period-specific shocks common to all states in any given year. We also control for month of interview to account for idiosyncratic month differences. Throughout, we cluster the standard errors at the state level (Bertrand, Duflo, and Mullainathan 2004).[14] Regressions are weighted to be population representative, and the main sample is all women aged 19-64 interviewed by the BRFSS in survey years 1988-2000 with responses to the relevant Pap test questions.

4. Results

In Figure 1 we show the trend from 1988 to 2000 for our main outcomes: Ever had Pap test, Pap test in the past two years, and Pap test in the past year. Several features are notable. First, Pap test rates are very high: about 95 percent of women age 19-64 report ever having had a Pap test, while over 80 percent report having had one in the past two years and about 70 percent have had one in the past year. Second, Pap test rates were very stable over the sample period, in contrast to what has been established for mammography - the other major women's preventive health cancer screening behavior that has been studied over the 1990s (Bitler and Carpenter 2014a).[15]

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however, control for the presence of Pap test mandates. Bitler and Carpenter (2014b) also find that NBCCEDP significantly increased Pap test use among 50-64 year old women from 1991-2000.

[14] Our policy data come from the National Cancer Institute's State Cancer Legislative Database (SCLD) (NCI, 2005). SCLD tracks every piece of legislation pertaining to different types of cancers, including cervical cancer. Our information on state participation in the NBCCEDP program comes from personal correspondence with David Howard. Our information on direct access laws comes from Baker and Chan (2007).

[15] Over this time period national recommended guidelines were unchanged. A 1987 consensus panel convened by the American Cancer Society and supported by the American College of Obstetricians and Gynecologists (ACOG) and other major medical organizations recommended that starting at age 18 or with the onset of sexual activity all women should have an annual pelvic examination including a Pap test. After at least 3 annual consecutive normal Pap tests, the interval between Pap tests could be extended at the physician's discretion (Waxman 2005). These guidelines remained in place until the ACS issued revised guidelines in November 2002, the United States Preventive Services Task Force issued guidelines in

Table 1 presents descriptive statistics of the key demographic variables used in this analysis for adult women in the BRFSS. We present demographic characteristics (e.g., age, race, education, marital status), as well as the key cervical cancer screening outcomes and means of policy variables. Most of the sample is white non-Hispanic, while about 11% of the sample is black non-Hispanic, and 10 percent of the sample is Hispanic. About 45 percent of the sample has a high school degree or less. Over 60 percent of the sample is married and 60 percent is employed. Nearly 85 percent of women report that they have a health plan (our proxy for health insurance). Regarding health outcomes and the policy variables, 70 percent of women report that they had a Pap test in the past year, with higher rates for past two-year and lifetime Pap test rates. Finally, Table 1 shows that about 37.4 percent of the sample was treated by a mandate for an annual Pap test.

We present the baseline difference-in-differences results in Table 2 for the main Pap test screening outcomes. Each entry in the table is from a separate model. We present coefficient estimates on the key mandate variable of interest, though the models control for all the covariates described above including state and year fixed effects. Thus, the printed estimate is the difference-in-differences estimate of β_2 in equation (1) above. The format of Table 2 is as follows: In the top row we present estimates from the full 1988-2000 sample. The middle panel restricts attention to individuals with a health plan (our proxy for health insurance, reported for 1991-2000), while the bottom panel shows results for women without a health plan. Since our hypotheses about the effects of the

January 2003, and the ACOG issued revised guidelines in August 2003. These guidelines differed somewhat in terms of the recommended age to begin screening and the recommended frequency of screening. For example, the current ACS guideline recommends that women not begin cervical cancer

cancer screening insurance mandates rely mainly on an insurance mechanism, the health plan/no health plan distinction is important for interpretation.[16] We present results for Pap test in past two years in column 1, Pap test in the past year in column 2, Ever had a Pap test in column 3, and Mammogram in the past two years in column 4. The last outcome is a key placebo test: If Pap test mandates were correlated with other women's health initiatives or programs more generally, we might expect to observe spurious increases in mammography screenings (which were not covered by the mandates we study) coincident with cervical cancer mandate adoption; the estimate is one-third as large as our effect of interest.[17]

The first column in the top panel of Table 2 shows that Pap test mandates are estimated to have significantly increased the likelihood a woman reports having had a Pap test in the past two years by 1.3 percentage points. Relative to the average of this outcome, this represents a 1.6 percent effect.[18] In the second column we also see that the presence of a Pap test mandate is associated with a statistically significant increase of 1.1 percentage points in the likelihood a woman reports she received a Pap test within the past year, and in the third column we estimate that a Pap test mandate increased the likelihood a woman reports she ever had a Pap test by 0.8 percentage points. Finally, we

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screenings until age 21. Again, over our sample period there were no substantive changes in these recommended guidelines.

[16] Since the health plan variable is only available from 1991 onward, our sample sizes in the middle and bottom panel are slightly smaller than in the top panel (though only 14 and 25 states asked the cervical cancer screening questions in 1988 and 1989, respectively).

[17] In results not reported but available upon request we also estimated models that included controls for the presence of any state mandate for breast cancer screening, which we study in companion work (Bitler and Carpenter 2014a). These mandates were also adopted by states over this period, though they were generally adopted in different years, were adopted by more states, and importantly only applied to the older women in the sample. Controlling for these mandates did not substantively affect the estimates on the cervical cancer screening mandates.

[18] The full set of coefficient estimates on the demographic control variables is available upon request. Older women are significantly less likely to have had recent Pap tests compared to young women and less

find no economically or statistically significant relationship between the presence of a cervical cancer screening mandate and the likelihood a woman reports she received a mammogram in the past 2 years; the point estimate on the Pap test mandate is 0.1 percentage points.[19]

In the middle and bottom panels of Table 2 we directly assess the importance of the insurance channel. The intuition here is straightforward: If the mechanism through which cervical cancer screening mandates increase Pap test use is through more generous insurance coverage (as we hypothesize), then the effects should be observed primarily in the sample of women with a health plan (our proxy for health insurance). If, in contrast, we observed that the effect was mainly driven by women without a health plan, this would cast doubt on the insurance mechanism described above.[20] The results from this exercise in the middle and bottom panels of Table 2 provide strong evidence that the cervical cancer screening mandates significantly increased utilization through the mechanism of insurance. For each of those two outcomes, the coefficient on the Pap test mandate variable in the insured sample is positive, larger than the full sample estimate, and statistically significant.[21] Moreover, the associated estimates on the Pap test mandate variable for the uninsured sample in columns 2 and 3 are smaller than the estimates for the insured sample and are not statistically different from zero. In contrast, the results in column 3 for lifetime Pap test use stratified by insurance status do not support a role for

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educated women are significantly less likely to have had Pap tests compared with more educated women. Black women and married women are significantly more likely to have had a Pap test than other women.

[19] Examining the probability a woman obtained a mammogram in the past year or in her lifetime similarly returned no evidence for an effect of Pap test mandates on those outcomes.

[20] We also tested for an effect of Pap test mandates on the likelihood of being insured and found no meaningful relationship. We similarly tested this hypothesis using the March CPS (which does separately identify source and type of insurance) and did not find that Pap test mandates were significantly associated with the likelihood a woman reported having private or any insurance.

[21] Recall that the insurance questions were only asked starting in 1991, however.

the Pap test mandates at increasing utilization: although we estimate that Pap test mandates are associated with a statistically significant increase in the likelihood of ever having had a Pap test among women with a health plan, the estimated effect for women without a health plan is larger in magnitude.[22] Because the timing of the link between the policy and the outcome is stronger for the past two year and past year Pap test outcomes (compared to lifetime Pap test),[23] and because the results by insurance status support a mandate-based interpretation for these two recent Pap test outcomes, we focus on results for past two year and past year screening in the remaining tables.

Table 3 shows results separately by race/ethnicity and health plan status. As with Table 2, each entry in Table 3 is from a separate DD model. The top panel reports results for Hispanic women, the middle panel reports results for non-Hispanic white women, and the bottom panel reports results for non-Hispanic black women.[24] Columns 1-2 (for Pap test in the past two years and Pap test in the past year, respectively) report results for the sample of women with a health plan, while columns 3-4 restrict attention to women without a health plan. The results in Table 3 strongly support a causal role of Pap test mandates at increasing Pap test rates for Hispanic women and non-Hispanic white women. For these two groups of women, the mandate coefficients are large, positive, and statistically significant in the sample of women with a health plan and are much smaller

[22] Note that any omitted variables correlated both with lifetime Pap test rates and Pap test mandates that are not picked up by our direct controls for policies (such as direct access laws or implementation of the NBCCEDP program for low-income women) are unlikely to explain the unexpected pattern in column 1 of Table 2 because they would most likely produce similar patterns for the outcomes in columns 2 and 3 as well (which we do not observe).

[23] That is, for the past year and past two-years Pap test outcomes we are more credibly able to link the timing of the policy variation to the screenings under study. For the ever Pap test outcome, in contrast, we are using contemporaneous laws out of necessity, but we have no way of knowing when in the woman's lifetime she had pap test. Since women are recommended to get cervical cancer screenings in young adulthood when they become sexually active, for most of the adult women in our sample there is likely to be a very long lag between their first screening and their most recent screening.

and statistically insignificant in the sample of women without a health plan. Effects for Hispanic women are particularly large: 4-5 percentage point increases (versus the 1.5-1.6 percentage point increases estimated for non-Hispanic white women).[25] Results for black women in the bottom panel of Table 3 do not conform to a mandate-based explanation, as all the increases in Pap test rates correlated with mandate adoption are driven by women without a health plan.[26]

We focus on Hispanic and non-Hispanic white women in the remaining analyses, and we performed several other robustness checks (not reported but available upon request) on these samples. First, excluding controls for the other aspects of the cervical cancer screening policy environment (e.g., direct access laws and NBCCEDP rollout) did not appreciably change the results. Second, models that included linear state trends similarly returned qualitatively similar results to those in Table 3. Third, models that restrict attention to states comprising a balanced BRFSS sample from 1990-2000 (recall that only a handful of states asked the Pap test questions in 1988 and 1989) also returned similar results and continued to support a role for the state mandates at increasing cervical cancer screenings.

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[24] The sample of 'other race' women is too small to be informative.

[25] Kearney and Levine (2009) also find larger effects for Hispanic women in the context of a different women's health policy; specifically, they study income-based waivers to state Medicaid programs for family planning services and their effects on birth rates.

[26] We explored many possible explanations for the findings for black women. We found no evidence that differences in marital status for non-Hispanic black women compared to Hispanic and non-Hispanic white women could explain the differences in Table 3 (which might be plausible given well-known differences in marriage rates by race/ethnicity and the importance of spousal insurance coverage). We similarly found no role for differences in the geographic distribution of women by race/ethnicity. Adding a control for Planned Parenthood availability in a state/year as a proxy for access by uninsured women to free or sliding scale OB/GYN care (where Pap tests are likely to be provided) similarly did not change the results, and the same was true for a crude measure of the number of abortion providers in a state. Finally, we note we do not have information on when state Medicaid programs started covering Pap tests. We fielded our own survey of state Medicaid offices to try to obtain this information but were unsuccessful in obtaining high quality data for a substantial number of states on the timing of when specific cancer screening benefits were

Finally, in Table 4 we show estimated mandate effects by age and education for Hispanic and non-Hispanic white women with a health plan. The top panel of Table 4 reports results for the sample of 19-34 year olds, while the second panel reports results for 35-64 year olds. The third panel reports results for women with a high school degree or less, while the bottom panel reports results for women with at least some college education. Columns 1-2 report results for Hispanic women with a health plan (for Pap test in the past two years and Pap test in the past year, respectively), while columns 3-4 report results for non-Hispanic white women with a health plan (similarly for the two Pap test outcomes). The results by demographic group in Table 4 for Hispanic women show that the mandate effects are much larger in magnitude for younger Hispanic women; for older Hispanic women we do not find statistically significant effects of cervical cancer screening mandates on Pap test utilization. When we separately examine low-educated and high-educated Hispanic women, we find evidence of sizable mandate effects in both groups. For non-Hispanic white women, in contrast, we find that the mandate effects are concentrated in the 35-64 year old sample, with much smaller estimated effects for 19-34 year olds that are not statistically significant. We do not find clear patterns of differential effects of mandates by education for non-Hispanic white women, though the coefficient estimate for the Pap test in the past two years outcome is twice as large in magnitude for the lower educated group compared to the more educated group. Notably, all of the estimates in Table 4 are positive in sign, suggesting that mandates uniformly increased Pap test rates for Hispanic and non-Hispanic white women.

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covered. We reiterate, however, that we do control for state variation in the timing of adoption of Section 1115 Family Planning waivers to Medicaid which covered Pap tests in many states.

5. Conclusion

The results above suggest that insurance mandates requiring coverage of Pap tests significantly increased Pap test use rates, even though these screenings are cheap and utilization was already quite high by the late 1980s. We estimate that adoption of a cervical cancer screening mandate significantly increased past two-year cervical cancer screenings by 1.3 percentage points. These effects are plausibly observed for women with a health plan, are not observed for other women's health outcomes (e.g., mammograms), and are especially large for Hispanic and (to a lesser extent) non-Hispanic white women.

Given recently adopted federal health reform requires coverage of Pap tests, what is the importance and implication of our findings? There are several. First, our results are highly suggestive that federal health reform should significantly increase screenings, as the state experiments of the 1990s were very similar in structure to the federal law, with a couple of major exceptions: namely, that the federal law does not exempt self-insured firms and that the federal law prohibits cost sharing. Both of these features of the federal law suggest that it should be expected to increase screenings to a greater extent than the state laws we study here. Second, however, our results suggest that studies evaluating the effects of the preventive care provision of federal health reform need to take account of pre-existing state law variation since the federal ACA should be a much larger insurance treatment in states that had no pre-existing mandate requiring private insurers to cover Pap tests. Third, our results are especially interesting and important given the very low costs of the services we study here. Unlike expensive benefits such as mammograms and infertility treatment, Pap tests could have plausibly been paid for

without insurance by many women, and so our results speak to the potential for insurance-based interventions to increase uptake of even low-cost services. As such, our findings could have implications for other cheap benefits such as flu shots.

Overall, our results significantly advance our understanding of how state insurance mandates can increase utilization of even cheap services with utilization rates that are already very high. Studying the effects of federal health reform on preventive care outcomes within the context of these pre-existing state mandates is an important next step for future research.

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Figure 1
Pap Test Rates Among 19-64 Year-Old Women
BRFSS 1988-2000

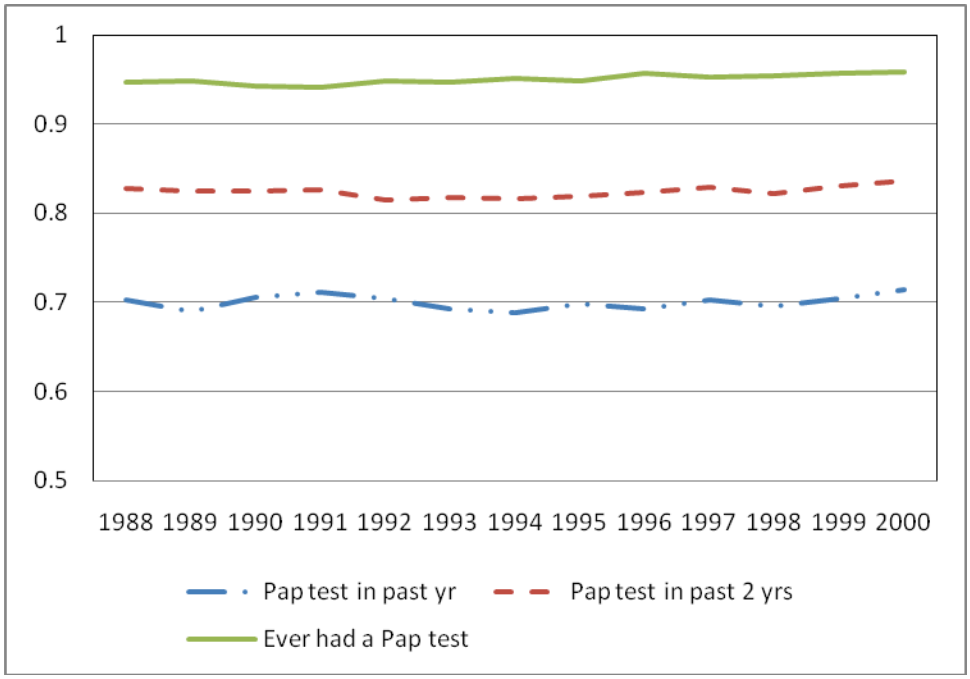

Table 1
Descriptive Statistics, 19-64 year old BRFSS Females

Variable	Mean
White non-Hispanic	.748
Black non-Hispanic	.108
Other race non-Hispanic	.037
Hispanic	.102
Less than high school degree	.112
HS degree	.333
Some college	.295
Bachelors degree or more	.259
Married	.621
Widowed/Divorced/Separated	.175
Never married	.175
Living with a partner	.027
Employed	.600
Self-employed	.064
Unemployed	.055
Not in labor force	.279
Has a health plan (1991-00)	.843
Ever had a Pap test	.951
Had a Pap test within the past 2 years	.824
Had a Pap test within the past year	.700
Treated by mandate for annual Pap test	.374
N	602814

Author calculations from 1988-2000 BRFSS for adult females 19-64. Some of the variables are not defined in some of the years (e.g., presence of health insurance was not asked until 1991).

Table 2:
Pap Test Mandates Significantly Increased Recent Pap Test Use Among Insured
DD Models with State and Year Fixed Effects
BRFSS women 19-64, 1988-2000

Outcome is →	(1) Pap test in past 2 years	(2) Pap test in past year	(3) Ever had a Pap test	(4) Mammogram in past 2 years (placebo test)
All (88-2000)				
Treated by mandate for annual Pap test	.013**	.011*	.008***	.001
	(.006)	(.006)	(.002)	(.007)
Adjusted R-squared	.05	.04	.09	.31
N	599163	599163	602407	657847
Women with a Health Plan (91-2000)				
Treated by mandate for annual Pap test	.018***	.017**	.007***	.005
	(.007)	(.007)	(.002)	(.004)
Adjusted R-squared	.04	.04	.07	.36
N	475705	475705	478192	477898
Women without a Health Plan (91-2000)				
Treated by mandate for annual Pap test	.010	.014	.021***	.008
	(.012)	(.014)	(.007)	(.015)
Adjusted R-squared	.06	.06	.10	.14
N	80332	80332	80888	80816

Notes: Each column shows the results from a separate DD model. All models include state, month, and year fixed effects, as well as controls for: 5-year age groups (19-24, 30-34, 35-39, 40-44, 45-49, 50-54, 55-59, and 60-64; 25-29 is the excluded category), race (black, other race; white is the excluded category), Hispanic ethnicity, education (less than high school, high school degree, some college, and DK/RF; college degree or more is the excluded category), and marital status (never married, widowed/divorced/separated, cohabiting, DK/RF; married is the excluded category). All models also control for the following variables for each state and year: presence of a direct access law for OB/GYNs; presence of a National Breast and Cervical Cancer Early Detection Program (NBCCEDP); Section 1115 Family Planning waivers to Medicaid; share of women 15–44 with private health insurance; share of women who work or who have a husband who works at a firm with 24 or fewer employees, 25–99 employees or 100 or more employees; the unemployment rate; welfare reform; the level of HMO penetration (as a share of the population); the number of obstetric beds per 100 women 15–44, the eligibility threshold for Medicaid eligibility for a pregnant woman in the state as a share of the FPL; and the share urban, share black, and share Hispanic in the state. * significant at 10%; ** significant at 5%; *** significant at 1%. Standard errors throughout are clustered at the state level and estimates are weighted.

Table 3:
Mandate Effects Driven by Hispanic and White, non-Hispanic Women
DD Models with State and Year Fixed Effects
BRFSS women 19-64, 1991-2000

Outcome is →	(1) Pap test in past 2 years	(2) Pap test in past year	(3) Pap test in past 2 years	(4) Pap test in past year
Sample is →	Has a health plan	Has a health plan	Does not have a health plan	Does not have a health plan
Hispanic				
Treated by mandate for annual	.040**	.052***	-.007	.018
Pap test	(.016)	(.018)	(.029)	(.027)
Adjusted R-squared	.04	.03	.06	.05
N	26368	26368	9784	9784
White, non-Hispanic				
Treated by mandate for annual	.016**	.015**	-.014	-.011
Pap test	(.007)	(.007)	(.018)	(.018)
Adjusted R-squared	.04	.04	.08	.07
N	384299	384299	55521	55521
Black, non-Hispanic				
Treated by mandate for annual	.024**	.024	.091***	.094***
Pap test	(.011)	(.018)	(.029)	(.034)
Adjusted R-squared	.04	.04	.07	.07
N	44938	44938	10926	10926

Each entry is from a separate model. All models include state, month, and year fixed effects, as well as controls for: 5-year age groups (19-24, 30-34, 35-39, 40-44, 45-49, 50-54, 55-59, and 60-64; 25-29 is the excluded category), education (less than high school, high school degree, some college, and DK/RF; college degree or more is the excluded category), and marital status (never married, widowed/divorced/separated, cohabiting, DK/RF; married is the excluded category). All models also control for the following variables for each state and year: presence of a direct access law for OB/GYNs; presence of a National Breast and Cervical Cancer Early Detection Program (NBCCEDP); Section 1115 Family Planning waivers to Medicaid; share of women 15–44 with private health insurance; share of women who work or who have a husband who works at a firm with 24 or fewer employees, 25–99 employees or 100 or more employees; the unemployment rate; welfare reform; the level of HMO penetration (as a share of the population); the number of obstetric beds per 100 women 15–44, the eligibility threshold for Medicaid eligibility for a pregnant woman in the state as a share of the FPL; and the share urban, share black, and share Hispanic in the state. * significant at 1%; ** significant at 5%; *** significant at 1%. Standard errors throughout are clustered at the state level and estimates are weighted.

Table 4:
Mandate Effects by Age and Education, Hispanic and White non-Hispanic Women
DD Models with State and Year Fixed Effects
BRFSS women 19-64 with a health plan, 1991-2000

Outcome is →	(1) Pap test in past 2 years	(2) Pap test in past year	(3) Pap test in past 2 years	(4) Pap test in past year
Sample is →	Hispanic women	Hispanic women	White, non-Hispanic women	White, non-Hispanic women
19-34 year olds				
Treated by mandate for annual	.057**	.094***	.010	.004
Pap test	(.027)	(.025)	(.009)	(.008)
Adjusted R-squared	.05	.03	.05	.03
N	11858	11858	120846	120846
35-64 year olds				
Treated by mandate for annual	.019	.014	.019*	.020**
Pap test	(.030)	(.029)	(.010)	(.009)
Adjusted R-squared	.03	.02	.03	.03
N	14510	14510	263453	263453
HS degree or less				
Treated by mandate for annual	.042*	.065**	.022**	.013
Pap test	(.021)	(.025)	(.009)	(.008)
Adjusted R-squared	.03	.03	.04	.04
N	13678	13678	144655	144655
Some college or more				
Treated by mandate for annual	.041*	.043	.011	.015*
Pap test	(.023)	(.026)	(.007)	(.008)
Adjusted R-squared	.06	.03	.04	.03
N	12661	12661	239358	239358

Each entry is from a separate model. All models include state, month, and year fixed effects, as well as controls for: 5-year age groups (19-24, 30-34, 35-39, 40-44, 45-49, 50-54, 55-59, and 60-64; 25-29 is the excluded category), race (black, other race; white is the excluded category), Hispanic ethnicity, education (less than high school, high school degree, some college, and DK/RF; college degree or more is the excluded category), and marital status (never married, widowed/divorced/separated, cohabiting, DK/RF; married is the excluded category). All models also control for the following variables for each state and year: presence of a direct access law for OB/GYNs; presence of a National Breast and Cervical Cancer Early Detection Program (NBCCEDP); Section 1115 Family Planning waivers to Medicaid; share of women 15–44 with private health insurance; share of women who work or who have a husband who works at a firm with 24 or fewer employees, 25–99 employees or 100 or more employees; the unemployment rate; welfare reform; the level of HMO penetration (as a share of the population); the number of obstetric beds per 100 women 15–44, the eligibility threshold for Medicaid eligibility for a pregnant woman in the state as a share of the FPL; and the share urban, share black, and share Hispanic in the state. * significant at 1%; ** significant at 5%; *** significant at 1%. Standard errors throughout are clustered at the state level and estimates are weighted.