Published in final edited form as:

J Health Care Poor Underserved. 2014 February ; 25(1 0): 109–121. doi:10.1353/hpu.2014.0063.

The Impact of Insurance Coverage during Insurance Reform on Diagnostic Resolution of Cancer Screening Abnormalities

Alok Kapoor, MD, MSc, Tracy A. Battaglia, MD, MPH, Alexis P. Isabelle, MPH, Amresh D. Hanchate, PhD, Richard L. Kalish, MD, MPH, Sharon Bak, MPH, Rebecca G. Mishuris, MD, Swati M. Shroff, MD, and Karen M. Freund, MD, MPH

Healthcare Disparities Research Program, Section of General Internal Medicine, Boston Medical Center (BMC) and Boston University School of Medicine (BU-SOM), 801 Massachusetts Ave, Boston, MA 02118 [AK, AH]; the Women's Health Unit, Boston Medical Center and BU-SOM [TAB, API, SB]; VA Boston Healthcare system, Boston [AH]; the Division of Primary Care, Lahey Clinic, Burlington, Massachusetts [RLK]; Division of General Medicine and Primary Care, Brigham and Women's Hospital and Harvard Medical School (HMS) [RGM]; Department of Medicine, Massachusetts General Hospital and HMS [SS]; and the Institute for Clinical Research and Health Policy Studies, Tufts Medical Center and Tufts University School of Medicine [KMF]

Abstract

We examined the impact of Massachusetts insurance reform on the care of women at six community health centers with abnormal breast and cervical cancer screening to investigate whether stability of insurance coverage was associated with more timely diagnostic resolution. We conducted Cox proportional hazards models to predict time from cancer screening to diagnostic resolution, examining the impact of 1) insurance status at time of screening abnormality, 2) number of insurance switches over a three-year period, and 3) insurance history over a three-year period. We identified 1,165 women with breast and 781 with cervical cancer screening abnormalities. In the breast cohort, Medicaid insurance at baseline, continuous public insurance, and losing insurance predicted delayed resolution. We did not find these effects in the cervical cohort. These data provide evidence that stability of health insurance coverage with insurance reform nationally may improve timely care after abnormal cancer screening in historically underserved women.

Keywords

Health Reform; insurance coverage; safety-net systems; minority health

The Affordable Care Act (ACA) offers access to health care for millions of Americans without insurance. It is hoped that extending health insurance coverage, especially to low-income and minority groups will result in better access, better continuity of care, and better outcomes of care. There is a need for research to investigate the impact that the implementation of broader insurance coverage has on health within specific populations, especially those with documented disparities.

One mechanism by which insurance reform may improve health outcomes is by reducing not only the rate of uninsurance but also the instability in health insurance coverage. We define *insurance instability* in this paper as switches in insurance coverage or loss of coverage. Whereas there is an extensive literature^{1–8} on the negative impact of lacking insurance on a variety of health outcomes, fewer studies have examined the impact of insurance instability. On the other hand, one of the concerns with the implementation of this legislation is its potential for gaps or even losses in coverage that can disrupt health care delivery. Small changes in income could shift eligibility between government-subsidized and non-subsidized plans as one potential form of instability.^{9,10}

One way to evaluate the impact of insurance coverage and switches across a population is to identify a cohort of vulnerable patients with similar health utilization needs. One such group is women with abnormal breast and cervical cancer screening tests in need of diagnostic resolution. Cancer screening will only be effective if a woman with an abnormal test completes diagnostic follow-up in a sufficiently timely fashion in order to identify cancer early. Delays in diagnosis and treatment as little as three months have been shown to increase breast cancer recurrence^{4,11} and reduce survival rates; these delays are more common among vulnerable populations (defined by racial/ ethnic minority or low income status).^{12,13} Research to date¹⁴ has not examined the impact of switches or gaps in health insurance coverage for the outcome of diagnostic resolution.

In order to examine the impact of health insurance reform on diagnostic resolution after abnormal cancer screening, we conducted a secondary analysis of data from a study that spanned the time period of pre- and post-health insurance reform in the state of Massachusetts. Massachusetts health insurance reform included several approaches to provide near universal coverage. These included expansion of Medicaid, an individual mandate, a mandate for employers with 10 or more employees to provide premium support, and the development of the health insurance exchange called the Health Connector which connects consumers to two programs. The first, Commonwealth Care, provides subsidized insurance coverage for people with incomes up to 300% of the federal poverty line. The other, Commonwealth Choice, is a commercial insurance program available to small employers and individuals who do not qualify for subsidies. This study includes a cohort of minority and low-income women, i.e., women from groups whose members often do not have health insurance and are most susceptible to its loss when they do have it. We hypothesized that insurance instability, defined as switches in health insurance coverage including loss of coverage, would be associated with slower diagnostic resolution.

Methods

Population and eligibility

We conducted a secondary analysis of subjects included in the control arm of the Boston Patient Navigation Research Program (PNRP)¹⁵ which was designed to test the ability of a patient navigation intervention to improve timely diagnostic care in vulnerable populations. The population included women with abnormal breast or cervical cancer screening tests at six community health centers, five which are federally qualified, serving an urban population of women representing diverse racial, income, and insurance payer backgrounds.

We included women over 18 years of age with a breast or cervical cancer screening abnormality at one of six participating community health centers, from the control arm of PNRP, which received usual care. We included a random subset of up to 100 subjects from each health center from 2004–2005 (pre-reform) and all subjects with abnormal screening from 2007–2008 (post-reform).

The specific breast cancer screening abnormalities we included were abnormal mammograms, ultrasound or magnetic resonance imaging (MRI) coded according to the Breast Imaging Reporting and Data System (BIRADS),¹⁶ with scores corresponded with radiographic findings of lesions which were incomplete (BIRADS 0), probably benign (BIRADS 3), suspicious abnormality (BIRADS 4), or highly suspicious of malignancy (BIRADS 5), respectively. Abnormal clinical breast examinations with a mass or other lesion suspicious for cancer were additional eligibility criteria for entry into the study. Cervical cancer screening abnormalities included Pap test findings of low and highgrade squamous intraepithelial lesions (LGSIL and HGSIL), atypical cells of unknown significance (ASCUS) when reflex testing for high-risk human papilloma virus (HPV) was positive, or atypical glandular cells of unknown significance (AGUS). We excluded women who were pregnant at the time of screening as pregnancy may alter the time course for diagnostic procedures. We also excluded women with cognitive difficulties and major psychiatric diagnoses who may have been unable to participate in the navigation intervention (as part of the parent study).¹⁵ Lastly, we excluded people with less than one month of care at the health center, as we were unable to assess longitudinal insurance coverage.

Outcome

We collected all clinical and demographic data through the electronic medical records at each of the health centers. We abstracted race/ethnicity information from a single variable item categorized as White, Black, Hispanic, Asian, and other; prior research has demonstrated high concordance, with kappa values between 81% and 91% comparing these registration data with self-reported race and ethnicity.¹⁷ We imputed race/ ethnicity for 8% of subjects where registration data was missing, using the following items in hierarchical order: providers' notes in the medical record, primary language, country of origin, or the patient's surname.^{18,19} We imputed approximately 6% of records for language preference "other than English" if there was documentation of another language in the medical record, need for interpreter, or a result letter sent to the patient in a language other than English. The electronic charts we reviewed captured all screening studies and their results. We collected all subsequent information on the clinical diagnostic evaluation, including tests ordered and their results, through manual abstraction by trained abstractors. We abstracted 10% of records in duplicate for reliability assessment.¹⁵ As in the parent study, we measured time to diagnostic resolution as the number of days from screening to diagnostic resolution. In women with cervical cancer screening abnormalities, diagnostic resolution included colposcopy with or without biopsy or physician determination that colposcopy was not indicated. For women with breast screening abnormalities, diagnostic resolution included additional imaging, biopsy, or clinical examination by a breast health physician making a determination that no abnormality was present. For subjects eligible because of a BIRADS 3

result, where radiologists recommend follow-up in several six month intervals to check for changes, we measured date of diagnostic resolution beginning six months from the date of the index abnormality to the next imaging studies (which is consistent with our approach in prior work).¹⁵

Health insurance coverage variables

In order to define health insurance status, we manually abstracted billing reimbursement data for each woman 18 months before through 18 months after her index abnormal cancer screening, coding type of insurance coverage for the date of the abnormal screening test, and the date of care and type of coverage for all visits with a switch in insurance coverage. Using these data, we created four health insurance coverage variables as predictors of time to diagnostic resolution. They are described below.

1. *Index insurance status* at time of screening abnormality.
2. *Number of insurance switches* over the 36 months of observation. We defined an insurance switch as a change from one of five major types of insurance categories (private (including Commonwealth Choice), Medicare, Commonwealth Care, Medicaid, or uninsured) to another. If subjects had more than one type of coverage, we assigned the principal insurance category based on the following hierarchy ranked upon our hypothesized decreasing comprehensiveness of coverage: private insurance, Medicare, Commonwealth Care, Medicaid, and uninsured. We categorized individuals as having no, one, or two or more switches.
3. *Insurance coverage history*. Because the latter categorized those continuously insured and those never insured into the same group, we also defined insurance histories into five mutually exclusive categories: “always private” for those maintaining continuous private/commercial insurance; “always public” for those maintaining continuous coverage with either Medicaid or Medicare; “one or more switches, never uninsured” for those with one or more insurance switches during the 36 months of observation but never uninsured; “one or more switches uninsured” for any subject losing coverage at some point in the 36 months; and “always uninsured.”
4. *Time period: pre- vs. post-reform*. We compared time periods: post-health insurance reform (2007–2008) *versus* pre-health insurance reform (2004–2005) in order to understand the effect of health insurance reform independent of adjustment for insurance switches.

Analysis

We analyzed women with abnormal breast and cervical cancer screening separately, due to different courses of diagnostic evaluation, and differences in age and racial/ ethnic distribution in each group. We calculated descriptive statistics to report socio-demographic characteristics of the two study populations and to characterize the time to resolution in each population. We then constructed a series of Cox proportional hazard models to identify the independent effect of health insurance status on time to resolution, adjusting for age, race/ ethnicity, and language and clustering by facility. Due to violations in the proportion

hazards, we included an interaction term for time in the models, and report separate adjusted hazards ratios for 0–60 days of follow up and 61–365 days of follow-up.^{20,21}

We performed all analyses in SAS 9.2.²² The Boston University Medical Center Institutional Review Board and Boston HealthNet Research Subcommittee (the organization that reviews studies that involve community health centers affiliated with Boston Medical Center) approved this study.

Results

We included 1,946 women in our analysis, 434 from the pre-reform period and 1,512 from the post-reform period. We excluded 46 women (2.3%) who either had no billing data available, or who were in care at the health center for less than one month during the time of study. Women with abnormal breast cancer screening were in care for a mean of 26 (standard deviation SD = 9.1) months, and had a mean of 18 days in clinical care during that time. Women with abnormal cervical cancer screening had a mean of 15 days in clinical care over a mean of 23 (SD = 9.5) months. This long-term use of care at the health center allowed us to observe changes in insurance coverage over time.

Table 1 presents subject characteristics by type of cancer screening (breast or cervical) and by time period (pre- or post-reform). The mean age of women with abnormal breast and cervical cancer screening was 52 years (SD 11 years) and 28 years (SD 9 years), respectively. The population was racially and ethnically diverse; 35% of women were White, 32% were Black, and 28% were Hispanic; 66% spoke English as their primary language and 18% were Spanish-speaking. There are also significant changes over time in race/ethnicity and primary language between the pre- and post-reform time periods, reflecting temporal changes in the communities cared for at the health centers. There were significantly fewer uninsured subjects with abnormal breast cancer screening in the post-reform era compared with the pre-reform era (42% vs. 33%) ($p = .009$). In women with cervical cancer screening abnormalities, the proportion uninsured in the post-reform period diminished to half of the pre-reform level (36% to 18%).

Table 2 demonstrates the unadjusted association between insurance status and time to resolution at 60 and 365 days of follow-up. Privately insured women had the highest rates of resolution at both 60 and 365 days for breast screening abnormalities. Women with Medicaid insurance had the lowest rates of cervical screening resolution at 60 days, but this gap narrowed by 365 days. The number of switches did not affect time to resolution. Looking at insurance histories, women in continuous public or those uninsured in general had more delays than those with continuous private coverage. We did not find an overall effect before and after insurance reform on time to resolution for the entire group under study.

Table 3 provides the four health insurance coverage variables and hazards ratios adjusted for age, race/ethnicity, language and clustering by facility. Our analysis yielded the following findings. Within the cervical screening abnormalities none of the insurance coverage variables predicted time to resolution adjusted for socio-demographic characteristics. Within

the breast cancer cohort, insurance coverage did show several effects. Having Medicaid insurance (HR = 0.72 95% CI 0.60–0.88) or no insurance (HR 0.80, 95% CI 0.68–0.95) at the time of abnormal breast cancer screening was associated with delays in diagnostic resolution compared with having private insurance. While we found that the number of insurance switches does not affect time to resolution, those who lost insurance coverage at some point during the observation period had less timely diagnostic resolution (HR = 0.81 95% CI 0.66–0.99). We did not find an overall effect of reform period on diagnostic resolution.

Discussion

We developed a series of measures to analyze insurance coverage, stability, and reform for their impact on diagnostic resolution of cancer screening abnormalities among a vulnerable population of women seeking care at urban community health centers. We found that insurance coverage and stability of insurance coverage were predictors of timelier follow-up care for women with abnormal breast cancer screening but not for women with abnormal cervical cancer screening. Having Medicaid or no insurance at baseline and losing insurance coverage were associated with slower rates of diagnostic resolution compared with having private insurance and stable coverage, respectively. Comparing our entire cohort before and after insurance reform, we did not find any change in time to resolution for the entire population. We found that diagnostic resolution rates were generally quite high after abnormal breast cancer screening and somewhat lower after abnormal cervical cancer screening.

Although the impact of insurance instability has been documented primarily in the pediatric literature, a few reports^{5–7} have demonstrated its negative effect in adults. Authors of a 2008 systematic review¹⁴ identified seven studies examining the impact of gaining and losing health insurance on health care utilization. They found increased use of preventive and primary care with the gain of insurance. Other research⁸ has demonstrated that gaps in insurance coverage are linked to a lack of continuity in prescription refills. Gold and colleagues⁴ measured the effect of continuous and intermittent lack of insurance on quality indicators for diabetic patients receiving care from a federally qualified health clinic practice network. Those continuously and intermittently uninsured were less likely to have up-to-date glycosylated hemoglobin measurement, lipid testing, renal function assessment, or influenza vaccination. Bindman and colleagues²³ found that interruption in Medicaid coverage was associated with a 3.7-fold increase in ambulatory care sensitive hospitalizations compared with beneficiaries continuously insured.

Our findings that interruptions in insurance coverage result in delays in care are noteworthy in that diagnostic resolution required a short-term set of clinical activities. For many women it required one additional visit for imaging. At most it required three or four visits in order to obtain a biopsy and tissue diagnosis. This is in contrast to chronic disease management, which requires ongoing surveillance and behavioral management to affect outcomes. Our finding of delayed diagnostic resolution among subjects losing insurance with breast but not with cervical screening abnormalities may relate to differences in location of health care delivery. All health centers conducted colposcopy on site, whereas none provided diagnostic

imaging for breast care. For diagnostic breast care, a patient must go to a new care site, typically to a hospital, which would require insurance coverage for registration. For patients with lapsed insurance needing follow-up of an abnormal breast cancer screening result, days of delay would result. In comparison, the health centers had a policy of seeing patients once the appointment was made, and lapses of coverage would therefore not delay care. The lack of an impact after losing insurance coverage for follow-up after abnormal cervical cancer screening may also relate to Title X Family Planning Act funding.²⁴ This covered abnormal Pap smear follow-up at the health centers, thus providing coverage for uninsured patients to receive colposcopy as part of reproductive care, whereas Title X funding did not cover evaluation of breast abnormalities. Our finding of the difference between breast and cervical cohorts may therefore be related to the additional benefits to women of the Title X funding, providing gap coverage and preventing delays in care.

There are several limitations to our study. We were only able to determine switches associated with utilization of care. If someone did not use care during an uninsured gap, we would not have identified this switch into the uninsured state. Because we relied on health center data to determine subsequent care utilization, we may have missed utilization that occurred at other health care facilities. For example, if individuals covered by private insurance obtained diagnostic care at another health care institution, we would not have this information and would code this as a delay in diagnostic care. If this occurred, it would bias our results toward no difference between those continuously insured and those with gaps in coverage. Linking our data with enrollment files would assist in our understanding of gaps and switches in insurance. Movements to create state-level, all payer outpatient datasets²⁵ may facilitate reconciling this methodologic limitation in the future. Data from this study and other work²⁶ indicate that patients receiving care at our health centers continue to return even with changes in health insurance. Moreover, the fact that we detected an association for switches into an uninsured state despite this potential under ascertainment argues for the credibility of our finding. Unlike the authors of the Bindman study,²³ we were able to capture insurance coverage that was retroactively reinstated by looking retrospectively at paid claims. In addition, we examined screening outcomes exclusively in a population of women receiving care by safety-net providers. Our findings may not generalize to patients outside a safety-net care system, or to women without a usual source of primary care.

Our study has important implications. The impact of being uninsured and losing insurance is significant even in our context of short-term follow-up care. Our results speak to the need for full implementation of the Affordable Care Act, including Medicaid expansion into all states to ensure that patients who complete screening programs have the resources available to address abnormal screening findings. The absence of an effect for switches between public and private categories of insurance coverage is reassuring for the proposed changes, given that a subset of the population will likely undergo switches in coverage through employment and income changes. Lastly our data suggest that safety-net programs, such as Title X, may continue to play a critical role for underserved women in ensuring access to needed care even during insurance gaps.

Acknowledgments

We acknowledge support from the NIH through the following mechanisms:

RC1 MD004582-01—Comparative Effectiveness of Health Insurance Reform on Outcomes after Abnormal Cancer Screening (Karen Freund/Tracy Battaglia, MD).

U01CA116892—Boston Patient Navigation Research Program (Karen Freund/Tracy Battaglia)

KL2RR025770—Boston University Clinical and Translational Science Award KL2 (Alok Kapoor).

American Cancer Society—Harry and Elsa Jiler Clinical Research Professorship (Karen Freund).

Notes

1. Baker DW, Sudano JJ, Albert JM, et al. Lack of health insurance and decline in overall health in late middle age. *N Engl J Med*. 2001 Oct 11; 345(15):1106–1112. <http://dx.doi.org/10.1056/NEJMsa002887>. [PubMed: 11596591]
2. Baker DW, Sudano JJ, Albert JM, et al. Loss of health insurance and the risk for a decline in self-reported health and physical functioning. *Med Care*. 2002 Nov; 40(11):1126–1131. <http://dx.doi.org/10.1097/00005650-200211000-00013>. [PubMed: 12409857]
3. Doyle, JJ, Jr. Health insurance, treatment and outcomes: using auto accidents as health shocks. Cambridge, MA: National Bureau of Economic Research; 2005. <http://dx.doi.org/10.3386/w11099>
4. Gold HT, Do HT, Dick AW. Correlates and effect of suboptimal radiotherapy in women with ductal carcinoma in situ or early invasive breast cancer. *Cancer*. 2008 Dec 1; 113(11):3108–3115. <http://dx.doi.org/10.1002/cncr.23923>. [PubMed: 18932243]
5. Cummings JR, Lavarreda SA, Rice T, et al. The effects of varying periods of uninsurance on children's access to health care. *Pediatrics*. 2009 Mar; 123(3):e411–e418. <http://dx.doi.org/10.1542/peds.2008-1874>. [PubMed: 19254977]
6. Federico SG, Steiner JF, Beaty B, et al. Disruptions in insurance coverage: patterns and relationship to health care access, unmet need, and utilization before enrollment in the State Children's Health Insurance Program. *Pediatrics*. 2007 Oct; 120(4):e1009–e1016. <http://dx.doi.org/10.1542/peds.2006-3094>. [PubMed: 17908722]
7. Olson LM, Tang SF, Newacheck PW. Children in the United States with discontinuous health insurance coverage. *N Engl J Med*. 2005 Jul 28; 353(4):382–391. <http://dx.doi.org/10.1056/NEJMsa043878>. [PubMed: 16049210]
8. Gai Y, Gu NY. Association between insurance gaps and continued antihypertension medication usage in a US national representative population. *Am J Hypertension*. 2009 Dec; 22(12):1276–1280. Epub 2009 Sep 24. <http://dx.doi.org/10.1038/ajh.2009.188>.
9. Hwang A, Rosenbaum S, Sommers BD. Creation of state basic health programs would lead to 4 percent fewer people churning between Medicaid and exchanges. *Health Aff (Millwood)*. 2012 Jun; 31(6):1314–1320. <http://dx.doi.org/10.1377/hlthaff.2011.0986>. [PubMed: 22665844]
10. Sommers BD, Rosenbaum S. Issues in health reform: how changes in eligibility may move millions back and forth between medicaid and insurance exchanges. *Health Aff (Millwood)*. 2011 Feb; 30(2):228–236. <http://dx.doi.org/10.1377/hlthaff.2010.1000>. [PubMed: 21289343]
11. McLaughlin JM, Anderson RT, Ferketich AK, et al. Effect on survival of longer intervals between confirmed diagnosis and treatment initiation among low-income women with breast cancer. *J Clin Oncol*. 2012 Dec 20; 30(36):4493–4500. Epub 2012 Nov 19. <http://dx.doi.org/10.1200/JCO.2012.39.7695>. [PubMed: 23169521]
12. Elmore JG, Nakano CY, Linden HM, et al. Racial inequities in the timing of breast cancer detection, diagnosis, and initiation of treatment. *Med Care*. 2005 Feb; 43(2):141–148. <http://dx.doi.org/10.1097/00005650-200502000-00007>. [PubMed: 15655427]
13. Hershman DL, Wang X, McBride R, et al. Delay of adjuvant chemotherapy initiation following breast cancer surgery among elderly women. *Breast Cancer Res Treat*. 2006 Oct; 99(3):313–321. Epub 2006 Apr 1. <http://dx.doi.org/10.1007/s10549-006-9206-z>. [PubMed: 16583264]

14. Freeman JD, Kadiyala S, Bell JF, et al. The causal effect of health insurance on utilization and outcomes in adults: a systematic review of US studies. *Med Care*. 2008 Oct; 46(10):1023–1032. <http://dx.doi.org/10.1097/MLR.0b013e318185c913>. [PubMed: 18815523]
15. Battaglia TA, Bak SM, Heeren T, et al. Boston Patient Navigation Research Program: the impact of navigation on time to diagnostic resolution after abnormal cancer screening. *Cancer Epidemiol Biomarkers Prev*. 2012 Oct; 21(10):1645–1654. <http://dx.doi.org/10.1158/1055-9965.EPI-12-0532>. [PubMed: 23045539]
16. American College of Radiology. Illustrated breast imaging reporting and data system (BIRADS). Reston, VA: American College of Radiology; 2003. Available at: <http://www.acr.org/Quality-Safety/Resources/BIRADS/Mammography>
17. Laiteerapong N, Sherman B, Kim K, et al. Validation of Racial Categorization in a Hospital Administrative Database. *J Gen Intern Med*. 2005; 20(Suppl 1):130.
18. Schenker N, Parker JD. From single-race reporting to multiple-race reporting: using imputation methods to bridge the transition. *Stat Med*. 2003 May 15; 22(9):1571–1587. <http://dx.doi.org/10.1002/sim.1512>. [PubMed: 12704616]
19. Word, DL.; Perkins, RC. Building a Spanish Surname List for the 1990's—A New Approach to an Old Problem. Washington, DC: US Bureau of the Census; 1996.
20. Klein JP, Rizzo JD, Zhang MJ, et al. Statistical methods for the analysis and presentation of the results of bone marrow transplants. Part 2: Regression Modeling. *Bone Marrow Transplant*. 2001 Dec; 28(11):1001–1011. <http://dx.doi.org/10.1038/sj.bmt.1703271>. [PubMed: 11781608]
21. Weesie J. Survival analysis with time-varying covariates. *Stata Technical Bulletin*. 1998; 41:25–43.
22. SAS Institute. Statistical Analysis Software. Cary, NC: SAS Institute; 2013.
23. Bindman AB, Chattopadhyay A, Auerback GM. Interruptions in Medicaid coverage and risk for hospitalization for ambulatory care-sensitive conditions. *Ann Intern Med*. 2008 Dec 16; 149(12):854–860. <http://dx.doi.org/10.7326/0003-4819-149-12-200812160-00004>. [PubMed: 19075204]
24. US Department of Health & Human Services. Title X: The National Family Planning Program. Washington, DC: Office of Population Affairs; 1970. Available at: <http://www.hhs.gov/opa/title-x-family-planning/>
25. Parsons HM, Habermann EB, Stain SC, et al. What happens to racial and ethnic minorities after cancer surgery at American College of Surgeons National Surgical Quality Improvement Program Hospitals? *J Amer Coll Surg*. 2012 Apr; 214(4):539–547. Epub 2012 Feb 8. <http://dx.doi.org/10.1016/j.jamcollsurg.2011.12.024>. [PubMed: 22321524]
26. Peterson NB, Han J, Freund KM, et al. Inadequate follow-up for abnormal Pap smears in an urban population. *J Natl Med Assoc*. 2003 Sep; 95(9):825–832. [PubMed: 14527050]

POPULATION CHARACTERISTICS OF WOMEN WITH CANCER SCREENING ABNORMALITIES CARED FOR AT COMMUNITY HEALTH CENTERS, BEFORE AND AFTER MASSACHUSETTS HEALTH INSURANCE REFORM

Table 1

	Breast Pre-Reform (N = 201) N (%)	Breast Post-Reform (N = 962) N (%)	Cervical Pre-Reform (N = 231) N (%)	Cervical Post-Reform (N = 550) N (%)	Total (N = 1944) N (%)
Age					
18–25 years	0 (0)	3 (0)	130 (56)	265 (48)	398 (20)
26–35 years	2 (1)	5 (1)	66 (29)	186 (34)	259 (13)
36–45 years	57 (28)	335 (35)	22 (10)	71 (13)	485 (25)
46–55 years	70 (35)	309 (32)	10 (4)	19 (3)	408 (21)
56+ years	72 (36)	310 (32)	3 (1)	9 (2)	394 (20)
Race/ Ethnicity					
White	55 (27)	283 (29)	84 (36)	268 (49)	690 (35)
Black/ African American	100 (50)	341 (35)	54 (23)	121 (22)	616 (32)
Hispanic	35 (17)	325 (34)	76 (33)	116 (21)	552 (28)
Asian	1 (0)	13 (1)	0 (0)	44 (8)	58 (3)
Other	10 (5)	0 (0)	17 (7)	1 (0)	28 (1)
Primary Language					
English	139 (69)	532 (55)	152 (66)	467 (85)	1290 (66)
Spanish	23 (11)	256 (27)	32 (14)	38 (7)	349 (18)
Vietnamese	0 (0)	2 (0)	0 (0)	26 (5)	28 (1)
Albanian	1 (0)	15 (2)	0 (0)	6 (1)	22 (1)
Portuguese Creole/Cape Verdean Creole	0 (0)	21 (2)	0 (0)	0 (0)	21 (1)
Other	38 (19)	136 (14)	47 (20)	13 (2)	234 (12)
Index Insurance *					
Private	65 (32)	274 (28)	70 (30)	233 (42)	642 (33)
Medicare	17 (8)	94 (10)	6 (3)	12 (2)	129 (7)
Comm Care	0 (0)	85 (9)	0 (0)	49 (9)	134 (7)
Medicaid	34 (17)	175 (18)	71 (31)	159 (29)	439 (23)
Uninsured	85 (42)	334 (35)	84 (36)	97 (18)	600 (31)
Number of Insurance Switches**					
No switches	128 (64)	585 (61)	115 (50)	264 (48)	1092 (56)
One Switch	37 (18)	183 (19)	37 (16)	103 (19)	360 (19)
2+ Switches	36 (18)	194 (20)	79 (34)	183 (33)	492 (25)
Insurance Consistency***					
Always Private	39 (19)	198 (21)	37 (16)	154 (28)	428 (22)

	Breast Pre-Reform (N = 201) N (%)	Breast Post-Reform (N = 962) N (%)	Cervical Pre-Reform (N = 231) N (%)	Cervical Post-Reform (N = 550) N (%)	Total (N = 1944) N (%)
Always Public	32 (16)	178 (19)	25 (11)	82 (15)	317 (16)
Switch but never uninsured	39 (19)	209 (22)	45 (19)	123 (22)	416 (21)
Switch to Uninsured	34 (17)	168 (17)	71 (31)	163 (30)	436 (22)
Always Uninsured	57 (28)	209 (22)	53 (23)	28 (5)	347 (18)

* Insurance coverage at the time of the cancer screening

** Subjects were observed for 36 months: 18 months before and after their cancer screening

*** Description of insurance over the 36 months of observation

Table 2
FREQUENCY OF DIAGNOSTIC RESOLUTION AS A FUNCTION OF INSURANCE STATUS FOR WOMEN CARED FOR AT COMMUNITY HEALTH CENTERS WITH SCREENING BREAST AND CERVICAL CANCER ABNORMALITIES

	Breast		Cervical	
	Number Resolved in 0-60 days, (%)	Number Resolved in 0-365 days, (%)	Number Resolved in 0-60 days, (%)	Number Resolved in 0-365 days, (%)
Index Insurance*				
1. Private	277 (82)	317 (94)	108 (36)	252 (83)
2. Medicare	78 (70)	103 (93)	7 (39)	14 (78)
3. Medicaid	144 (69)	181 (87)	63 (27)	181 (79)
4. Comm Care	62 (73)	77 (91)	18 (37)	44 (90)
5. Uninsured	287 (69)	384 (92)	66 (36)	146 (81)
Number of Switches**				
1. No switches	519 (73)	650 (91)	128 (34)	302 (80)
2. One Switch	166 (75)	203 (92)	48 (34)	119 (85)
3. 2+ Switches	163 (71)	209 (91)	86 (33)	216 (82)
Insurance Coverage History***				
1. Always Private	194 (82)	222 (94)	67 (35)	158 (83)
2. Always Public	143 (68)	184 (88)	33 (31)	85 (79)
3. Switch but never uninsured	184 (74)	229 (92)	50 (30)	146 (87)
4. Switch to Uninsured	145 (72)	183 (91)	84 (36)	189 (81)
5. Always Uninsured	182 (68)	244 (92)	28 (35)	59 (73)
Reform Period ^a				
1. Pre- Reform	149 (74)	182 (91)	86 (37)	187 (81)
2. Post- Reform	699 (73)	880 (91)	176 (32)	450 (82)

* Insurance coverage at the time of the cancer screening

** Subjects were observed for 36 months: 18 months before and after their cancer screening

*** Description of insurance over the 36 months of observation

^a Comparison between women whose screening abnormalities in 2004-5 (Pre- Massachusetts Health Insurance Reform) and 2007-8 (Post Reform)

Table 3

TIME TO DIAGNOSTIC RESOLUTION AS A FUNCTION OF INSURANCE STATUS FOR WOMEN
CARED FOR AT COMMUNITY HEALTH CENTERS WITH SCREENING BREAST AND CERVICAL
CANCER ABNORMALITIES

Model with varying insurance status definition	Time to Resolution as Hazard ratio (95% CI) ^{ab}	
	Breast Cancer Screening Abnormality	Cervical Cancer Screening Abnormality
<i>1. Index Insurance Status</i> [*]		
Private	Ref	Ref
Medicare	0.90 (0.71, 1.14)	0.81 (0.48, 1.36)
Medicaid	0.72 (0.60, 0.88)	0.84 (0.68, 1.03)
Commonwealth Care	0.81 (0.63, 1.04)	1.12 (0.79, 1.58)
Uninsured	0.80 (0.68, 0.95)	1.00 (0.81, 1.24)
<i>2. Number of Insurance Switches</i> ^{**}		
0 Switches	Ref	Ref
1 Switch	1.08 (0.92, 1.26)	1.10 (0.88, 1.36)
2+ Switches	0.98 (0.83, 1.15)	1.06 (0.88, 1.29)
<i>3. Insurance Coverage History</i> ^{***}		
Always Private	Ref	Ref
Always Public	0.77 (0.62, 0.95)	0.88 (0.67, 1.17)
1+ Switches Never Uninsured	0.88 (0.73, 1.06)	1.00 (0.79, 1.26)
1+ Switches Uninsured	0.81 (0.66, 0.99)	0.98 (0.79, 1.22)
Always Uninsured	0.84 (0.69, 1.03)	0.81 (0.59, 1.13)
<i>4. Time Period</i>		
Pre-reform (2004–2005)	Ref	Ref
Post-reform (2007–2008)	0.86 (0.71, 1.05)	0.95 (0.79, 1.13)

* Insurance coverage at the time of the cancer screening

** Subjects were observed for 36 months: 18 months before and after their cancer screening

*** Description of insurance over the 36 months of observation

^a All models adjusted for age, race, language, clustering by CHC; models 1 and 4 also adjust for index insurance type.

^b Hazard ratio reflects effect for an entire 365 day period unless otherwise specified. HR <1 indicates greater delay in time to resolution compared with reference group.