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Health Insurance Coverage and Racial Disparities in Breast Reconstruction after Mastectomy

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Abstract

Background—Breast reconstruction after mastectomy offers clinical, cosmetic, and psychological benefits compared with mastectomy alone. Although reconstruction rates have increased, racial/ethnic disparities in breast reconstruction persist. Insurance coverage facilitates access to care, but few studies have examined whether health insurance ameliorates disparities.

Methods—We used the Nationwide Inpatient Sample (NIS) for the years 2002 – 2006 to examine the relationships between health insurance coverage, race/ethnicity, and breast reconstruction rates among women who underwent mastectomy for breast cancer. We examined reconstruction rates as a function of the interaction of race and the primary payer (self-pay, private health insurance, government) while controlling for patient comorbidity, and we used generalized estimating equations (GEE) to account for clustering and hospital characteristics.

Findings—Minority women had lower breast reconstruction rates than white women (AOR=0.57 for African-American; 0.70 for Hispanic; 0.45 for Asian; $p<0.001$). Uninsured women (AOR=0.33) and those with public coverage were less likely to have reconstruction (AOR=0.35; $p<0.001$) than privately insured women. Racial/ethnic disparities were less prominent within insurance types. Minority women, whether privately or publicly insured, had lower odds of reconstruction than white women. Among those without insurance, reconstruction rates did not differ by race/ethnicity.

Conclusions—Insurance facilitates access to care, but does not eliminate racial/ethnic disparities in reconstruction rates. Our findings—which reveal persistent healthcare disparities not explained by patient health status—should prompt efforts to promote both access to and use of beneficial covered services for women with breast cancer.

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Background

In 2013, an estimated 232,340 women will be diagnosed with breast cancer in the United States (American Cancer Society, 2013). Mastectomy, or surgical removal of breast tissue, is undergone by approximately 37% of U.S. women with breast cancer (Habermann et al., 2010). Breast reconstruction after mastectomy offers clinical, cosmetic, and psychosocial benefits compared with mastectomy alone (Bezuhy et al., 2009; Ganz et al., 2002; Rowland et al., 2000). In addition, many women who receive reconstruction report improvements in body image and sexuality, enhanced quality of life and satisfaction with their appearance (Asgeirsson, Rasheed, McCulley, & Macmillan, 2005). One study found that 12 months after reconstructions, all respondents reported a positive change in life, 98% felt more whole, 88% felt it improved their femininity and 97% felt more comfortable in social situations (Brandberg, Malm, & Blomqvist, 2000). Though reconstruction may not be appropriate for all women or confer clinical benefits for cancer prognosis, few if any studies find clinical disadvantages (Asgeirsson et al., 2005).

In 2008, about a third of women who underwent mastectomy received reconstruction (Albornoz et al., 2012). With the passing of the 1998 Federal Women's Health and Cancer Rights Act (WHCRA), which mandated insurance coverage for breast reconstruction for group health and individual plans (that provide coverage for mastectomies) and the passing of state-laws that expand public insurance coverage for reconstruction, immediate breast reconstruction rates increased steadily from 20.8 % to 37.8 % between 1998 and 2008 (Albornoz et al., 2012). Advances in reconstruction techniques now provide women several options for breast reconstruction (Nguyen & Chang, 2013). Yet, despite these scientific advances and new health policies to expand access, disparities in breast reconstruction remain. A recent study using data from Pennsylvania, found that despite the passing of the federal WHCRA and a state law to extend Medicaid coverage for reconstruction in 2002, there were persistent racial disparities in rates of reconstruction (Yang, Newman, Reinke et al., 2013).

Reconstruction rates vary along several patient-level factors, including demographic characteristics, cancer stage, comorbidities, and access to information and knowledge regarding the procedure (Albornoz et al., 2012; Alderman, McMahon, & Wilkins, 2003; Case, Johantgen, & Steiner, 2001; Dehal, Abbas, & Johna, 2013; Reuben, Manwaring, & Neumayer, 2009). Race/ethnicity, in particular, is associated with disparities in reconstruction rates, with white women having higher rates than minority women. This disparity has been attributed to different breast cancer treatment experiences for minority women, such as lower rates of referral and acceptance (Morrow et al., 2005; Tseng et al., 2004), less knowledge about reconstruction (Morrow et al., 2005), lower likelihood of meeting with the plastic surgeon about the procedure (Alderman et al., 2009), and different personal and cultural preferences than white women (Rubin, Chavez, Alderman, & Pusic, 2013). Despite the body of research on racial differences in reconstruction, most studies focus on African-American and white women, with limited examination of differences among Hispanic women (e.g., Alderman et al. 2009). One study found lower rates of breast-conserving surgery among Asian American and Pacific Islander (AAPI) women than white women, with foreign-born AAPI women having the lowest rates (Goel et al., 2005). The role

of race/ethnicity in patient and provider decisions about reconstruction is complex, as race/ethnicity interacts with other factors known to influence reconstruction such as socioeconomic status and insurance coverage. Insurance coverage facilitates access to care, and individuals with private coverage are more than twice as likely to undergo breast reconstruction after mastectomy than those with Medicare, Medicaid, or no insurance (Sisco et al., 2012). However, African-American and Hispanic women are more likely to be uninsured than white women (Lillie-Blanton & Hoffman, 2005; Martinez & Cohen, 2013).

Few studies have examined the interaction between insurance status and race/ethnicity while controlling for other patient and hospital characteristics. Studies using regression models indicate that racial disparities persist even when controlling for insurance status (Albornoz et al., 2012; Christian et al., 2006; Yang, Newman, Lin et al., 2013). However, within each insurance type, racial disparities may differ. In addition, although past studies have controlled for hospital characteristics using multivariate analyses, few have controlled for correlation at the hospital level, potentially obscuring the independent effects of other characteristics (Albornoz et al., 2012; Kruper, Xu, & Bernstein, 2011). Other studies that examined reconstruction by race were limited to one hospital (Tseng et al., 2004; Wolfswinkel et al., 2013). This study controls for correlation within hospitals to clarify the relationship between health insurance coverage, race/ethnicity, and breast reconstruction rates among women who have undergone mastectomy for breast cancer.

This study aims to 1) calculate rates of reconstruction for women of different racial/ethnic groups; 2) identify the role of insurance type in receiving breast reconstruction; 3) examine the interactive effect of race/ethnicity and insurance type on the receipt of breast reconstruction.

Methods

This study is a pooled, retrospective analysis of hospital discharge records, using data from the Nationwide Inpatient Sample (NIS) of the Healthcare Cost and Utilization Project, Agency for Healthcare Research and Quality, from 2002 – 2006 (Agency for Healthcare Research and Quality, 2013). These data include all payers for inpatient care and approximate a 20% stratified sample of community hospitals in the United States. The NIS is the only national hospital database with discharge records for all patients, regardless of payer. NIS data include those covered by both public and private insurance programs as well as the uninsured. The quality and validity of NIS data have been previously reported, and these data have been widely used in health services research, including studies of mastectomy rates (Agency for Healthcare Research and Quality, 2013; Dehal et al., 2013; Russo, Milenkovic, & Steiner, 2006).

The study population includes patients under age 65 who underwent reconstruction post mastectomy in U.S. hospitals in 44 states from 2002 – 2006, whose records indicated primary payer as self, Medicaid, Medicare or private insurance, and who were missing no key characteristics (n=13,495). We used a previously validated and published method of identifying mastectomies using NIS data (Russo et al., 2006). Data are only available from 44 states, as the sampling methodology used to create the NIS does not include state as a

stratifier, thus some states are not included in the NIS. In addition, states that are included in the sample may require that restrict identifying variables or other hospital characteristics.

Outcome measure

Breast reconstruction as defined using *International Classification of Diseases, 9th revision* (ICD-9) diagnosis and procedure codes. Our analysis included any reconstruction post mastectomy, calculated using the following codes (ICD-9 codes 85.33, 85.35, 85.50-.54; 85.6, 85.70-85.79, 85.82-85, 85.57, 85.89, 85.93, 85.95, 86.60, 86.70-72, 86.74-75).

Independent variables

Health insurance status and race were key predictors in this study. In order to focus on differences in care based on insurance status, we limited the study population to cases where the hospital discharge record indicated the primary payer as Medicaid, private insurance, or self-pay (uninsured). We grouped patients into mutually exclusive categories using a hierarchy of any private insurance, any public insurance, and no insurance. In so doing, we excluded hospitalizations due to missing data on payment source (n=995; 3.6%). We also excluded women whose payment source was not private, public, or self-pay (no charge, n=323; 0.7%); other, n=1,372; 3.0%), who were missing on comorbidity status (2,397; 5.3%). We limited the sample to women under 65 since women 65 and over may have different patterns of reconstruction due to clinical and or/substantive reasons and because they were all covered by Medicare (women over age 65 with other forms of insurance coverage are also excluded). We also restricted analyses to those who were not missing on race (N=12,423) or hospital characteristics. We were unable to link hospital characteristics to about 53% of hospitalizations, as some states do not release hospital identifiers (AHRQ, 2013).

Of the 45,465 women under age 65 who had breast cancer, 19,017 underwent reconstruction. Our analysis controlled for other demographic factors, patient comorbidities and hospital characteristics. Demographic variables included age, race, insurance, and Charlson comorbidity index (Charlson, Pompei, Ales, & MacKenzie, 1987). Age was measured in years. Race was recorded on patient records. Racial categories included white, Hispanic, African-American, or Asian. The Charlson comorbidity index (CCI) assigns a score of 1, 2, 3, or 6 to medical conditions based on their severity, with a stepwise increase in mortality with each increase in score. We used a binary variable for Charlson index to adjust for effect of *any* comorbidity on reconstruction (no comorbidity, CCI score=0; and comorbidity, CCI score>=1). This approach has been used in previous studies on this topic indicating that a binary measure was a sufficient and valid approach (D'Hoore, Bouckaert, & Tilquin, 1996). In addition, previous work using a more detailed comorbidity measure shows little to no benefit for using a continuous score because of the generally low severity case mix for women undergoing mastectomies (Case et al. 2001). Thus, most other studies have used either collapsed scales (Alderman et al, 2009; Yang et al., 2013; Morrow et al, 2006) or binary measures (Case et al., 2001; Christian et al., 2006; Greenberg et al., 2008).

We also controlled for hospital characteristics including bed size, teaching status, region, and rural vs. urban location. We categorized hospital bed size as defined by the AHRQ

(small, medium, and large). Hospital teaching status was based on information from the American Hospital Association's Annual Survey of Hospitals. Hospital region included Northeast, South, West, and Midwest. Hospitals were classified as either urban or rural based on Core Based Statistical Area (CBSA) codes from Census 2000 data (Agency for Healthcare Research and Quality, 2013). Hospital size was coded specific to region, location, and teaching hospital status; for example, a large urban teaching hospital in the Northeast has 425 or more beds, whereas in the West, a large urban teaching hospital requires more than 325 beds.

Analyses

First, we presented the rates of reconstruction by year and by demographic and hospital characteristics for the total sample (Table 1) of women with and without reconstruction, and the rates of reconstruction for each racial group (Table 2). In addition, we conducted a series of multivariate regression analyses to assess the effect of race and insurance on reconstruction rates from 2002 – 2006. Because the data were clustered within hospitals, we used generalized estimating equations (GEE) to account for the correlated data structure (Hubbard et al., 2010). We estimated standard errors using robust variance estimation method. For multivariate analyses, we first estimated adjusted odds ratios for reconstruction for the full sample, controlling for patient, clinical, and hospital characteristics (Table 3). Second, we estimated odds ratios for reconstruction separately by insurance type: public, private, and uninsured (Table 4). Finally, to display racial differences in reconstruction by insurance status, we calculated predicted probabilities of reconstruction (Figure 1). Predicted probabilities were based on model-based calculations for an average woman in the sample receiving reconstruction: ages 45 – 55, living in the South, seeking care at large urban teaching hospital. All the predictors were held at mean value, with only insurance status and race varying these. Predicted probabilities were calculated using the covariate values and coefficients generated by the full GEE regression models described above. In sensitivity analyses, we ran regressions as nested models, controlling only for patient characteristics first, and then as a full model. Findings did not substantially change in magnitude or direction and thus we present full models in Table 3. The study was exempt from the [name of IRB blinded by *WHI* editors for peer review] Institutional Review Board. We performed all analyses using Stata 12.0 (StataCorp, 2012).

Results

Table one shows the count and percent of women under 65 who had a mastectomy with and without reconstruction. Breast reconstruction rates were highest among women under age 45 and lowest among those in the oldest age group, 55 to 65 (Table 1). The proportion of women with private coverage receiving reconstruction was more than twice as high as those with public coverage or the uninsured (48.8% compared to 23.0% and 18.0% respectively). White women comprised slightly less than half the sample, and had the highest rate of reconstruction (46.2%, compared to about 30% for minority women). Women receiving care at urban hospitals had more than three times the rate of reconstruction as those in rural hospitals (44.1% compared to 14.3%). Less than one-third of women in non-teaching hospitals underwent reconstruction while about half did so in teaching hospitals.

Table 2 shows the unadjusted rates of reconstruction by race/ethnicity. Across all racial/ethnic groups, women with private insurance accounted for the largest rate of reconstruction while the publicly insured had the lowest rate. Reconstruction increased over time for all racial/ethnic groups, but the trend was not linear and the magnitude of change was smallest for African-American women. Across all groups, rates were highest among women under 45 and declined with increasing age. Overall, other demographic, socio-economic, and hospital characteristics were similar across racial/ethnic groups.

Table 3 shows the results of the multivariate logistic regression for reconstruction, including hospital and patient characteristics. Minority women had lower reconstruction rates than white women (0.57 for African-American women, 0.70 for Hispanic women and AOR=0.45 for Asian women; $p<0.001$). Women without health insurance (AOR=0.33; $p<0.001$) and those with government coverage were less likely to have reconstruction (AOR=0.35; $p<0.001$) than privately insured women. Urban location and teaching status were significantly associated with higher likelihood of reconstruction. Women receiving care from large hospitals had nearly twice the odds of a reconstruction compared to those who received care in small hospitals (AOR=1.8, $p<0.001$). No differences were observed between medium and small hospitals or by region. Odds of reconstruction increased by 8% annually.

Focusing on differences by payer type, Table 4 models the outcomes within each insurance type. Panel A shows the results for women with public coverage; Panel B shows the results for private coverage, and Panel C for the uninsured. Controlling for age, comorbidities, clinical characteristics, and hospital characteristics, among women with public coverage, African-American and Asian women had lower odds of receiving reconstruction compared with white women (AOR .64, $p=.012$; AOR=0.35, $p=.045$, respectively). We found no significant difference among Hispanic and white women for odds of reconstruction. Among women with private coverage, African-American, Hispanic, and Asian women had lower odds for reconstruction compared to white women (AOR=0.44, 0.69 and 0.54 respectively; $p<0.001$). Among the uninsured, the odds of reconstruction were not statistically significant by race and ethnicity.

Higher levels of comorbidities were associated with lower odds of reconstruction among women with private insurance (AOR=.84, $p=.000$). Urban location and teaching status were associated with greater odds for reconstruction among all payer types, except urbanicity did not affect the odds for reconstruction among the uninsured. Region was weakly associated with reconstruction: the odds were lower for women with public insurance in the West compared to the Northeast). Large hospital size (compared to small) was significant only for the privately insured. Rates of reconstruction increased with time among the insured, but did not change for the uninsured.

Figure 1 displays the predicted probabilities (from the multivariate regression) for a reconstruction during hospitalization for a woman aged 45 – 54 with an average comorbidity score and with care delivered at a large urban teaching hospital in the South. For all racial/ethnic groups, women with public coverage had lower predicted probability of reconstruction than privately insured women: reconstruction ranged from 16.8% to 31.0%

for public coverage and 36.4% to 56.1% for private coverage. For all insurance types, Asian women were least likely to have reconstruction in this scenario. For example, the range of rates of reconstruction for Asian women was 16.0% to 36.4% across insurance types—uninsured, public, and private, while for African-American women, the race with next lowest range, the proportions ranged from 19.3% to 42.0%. Rates ranged from 23.0% to 47.3% for Hispanic women and 30.0% to 56.1% for white women.

Discussion

Health insurance coverage affects odds of breast reconstruction after mastectomy among U.S. women with breast cancer, but access to health insurance does not fully account for the notable racial/ethnic disparities in care. Controlling for clinical, demographic, and hospital factors, uninsured women and those with public coverage were less likely to receive reconstruction; further, minority women on public coverage were most disadvantaged. Our results are consistent with prior findings about the relationship between insurance coverage and breast reconstruction (Sisco et al., 2012) and racial differences in breast reconstruction (Rubin et al., 2013; Tseng et al., 2004).

Our findings of low overall rates of reconstruction and no differences by race or ethnicity among the uninsured are also consistent with a recent study from one underserved population (Wolfswinkel et al., 2013). Our study contributes new insight by discussing the interaction between race and insurance status. Our findings suggest that patients, providers, or both are influenced by financial or payment considerations, indicating a possible need to increase awareness of available coverage and barriers in practice and among patients, particularly minority women. Several prior studies have noted that reimbursement rates for procedures may limit the scope of reconstruction procedures provided by surgeons (Alderman et al., 2011; Nguyen & Chang, 2013). Reimbursement rates may also lead to fewer autologous compared to implant reconstruction due to the comparatively low reimbursement rate for former, more complex procedure (Albornoz et al., 2012). Indeed, more research is needed to understand if reimbursement rates influence the type of reconstruction surgeons provide (i.e., autologous or implant-based) (Nguyen & Chen, 2013). Cancer stage and severity are also associated with reconstruction. This might be explained by changes in the clinical profile of women with breast cancer. However, the patient population eligible for reconstruction has not changed significantly. Therefore, a population shift in health status does not likely explain the rise in reconstruction. Nor is it likely that the hospital characteristics that influence reconstruction have substantially changed (Hernandez-Boussard, Zeidler, Barzin, Lee, & Curtin, 2013).

As such, differences based on primary payer signal a need for greater policy attention to *realized vs. potential access* (Alegria et al., 2012) for those with insurance coverage. Payer-related differences also suggest a need for patient education regarding health insurance benefits and coverage for women with breast cancer.

Persistent racial differences within insurance indicate that factors other than insurance can influence the decision to have reconstruction. Patient preferences are another potential explanation for the disparities in reconstruction. Such preferences, however, do not arise in a

vacuum but are influenced by economic factors (Losken et al., 2004), patients' network and community (Duggal et al., 2013; Rosson, Singh, Ahuja, Jacobs, & Chang, 2008) and interactions with physicians (Alderman et al., 2003; Reaby, 1998). Patient-physician interactions vary by race, which may partly explain racial variation in patient preferences (Bird & Bogart, 2001). Several studies point to the critical role of physicians' discussion of the procedure and recommendations as among the main determinants in how women make decisions to pursue reconstruction (Duggal, Metcalfe, Sackeyfio, Carlson, & Losken, 2013; Greenberg et al., 2008; Morrow et al., 2005). Some authors have suggested that race-discordant patient-physician interactions may result in lower referral rates for reconstruction for minorities (Rubin et al., 2013). Prior studies have found racial and ethnic differences in trust and communication with physicians (Bird & Bogart, 2001).

In addition, minority and low-income women may also have less access to hospitals with qualified plastic surgeons (Krupey, Xu, & Bernstein, 2011) and therefore be less likely to discuss breast reconstruction with their physicians than their counterparts (Ganz, Timmer, & Kahn, 2009). Future studies (likely qualitative) need to examine patient preferences by race, how they form and impact decision-making for reconstruction.

In the U.S., race is often confounded with socioeconomic status (SES) and insurance is one measure of SES, thus some of the observed inequality in breast reconstruction could be due to SES-related factors not captured in the analysis. A number of studies find systematic differences in breast reconstruction by SES (Christian et al. 2006), including factors such as educational attainment and workforce participation. The relationship between SES and BR may be related to the fact that patients with lower SES are less likely to have a primary care provider and more likely to delay care. SES, particularly lower education, may also reduce a patient's ability to access information about the procedure (Alderman et al., 2009) and is negatively associated with reconstruction, independent of the woman's own race or ethnicity (Rosson et al., 2011). Less acculturated Hispanic women (Alderman et al., 2009) and low-income women (Krupey et al., 2011) often have less access to health information than white women or those with higher income. Future studies need to use detailed measures of SES to better understand the relationship between SES, race/ethnicity and breast reconstruction.

Hospital quality may also partly explain the lower rate of reconstruction among African-American women compared with white women (Keating, Kouri, He, Weeks, & Winer, 2009; Smedley, Stith, & Nelson, 2003). High surgical volume and high-volume surgeons are associated with better clinical outcomes and more procedures. Minorities are overrepresented in low-surgical volume hospitals and among low-volume surgeons (Aranda et al., 2008; Keating et al., 2009; Smedley et al., 2003). Other factors that may influence the use of breast reconstruction surgery that are not available in the data set include patient understanding of the procedure, health literacy, language barriers, and ability to take time off work (Alderman et al., 2009).

Implications for Policy and Practice

The Patient Protection and Affordable Care Act (ACA) of 2010 expands access to care by increasing options for health insurance coverage and providing subsidies to ensure greater

affordability of health insurance coverage. The ACA also includes a provision that prevents health plans from excluding persons due to pre-existing conditions or a history of cancer. In the past, insurance for these individuals would have been unavailable, costly, or restrictive with regard to scope of services or expenditures on treatments. The ACA also has provisions that improve the delivery of primary care, for example, by improving reimbursement rates for Medicaid and providing support for coordinated care teams (Davis, Abrams, & Kristof, 2011). Having a usual source of care can facilitate entry into appropriate treatment and improve adherence to follow-up care for cancer (Gerend & Pai, 2008). Other parts of the ACA focus on reducing disparities by 1) enhancing measurement and routine reporting of race/ethnicity (Hasnain-Wynia et al., 2012), 2) increasing diversity in clinician workforce. (Williams & Redhead, 2010)

Greater coverage does provide for a necessary component of access (financial access), and better primary care can improve detection and management of breast cancer, while improved data collection can monitor disparities in treatment. But these provisions do not guarantee that access to services will be realized for all women who may benefit from them. Our findings show significant racial/ethnic disparities in breast reconstruction following mastectomy even among breast cancer patients who have private health insurance. Insurance alone neither ensures access and quality nor addresses issues of cultural competency and diversity within the provider workforce. Yet, these issues may affect patient decisions about care.

The ACA and other health care policies aim to increase access to care by removing financial and cultural barriers. However, our findings point to a need for more involvement and support from culturally relevant advocacy organizations and for more leadership from providers when it comes to supporting breast cancer patients facing difficult decisions. Such support may be received from patient navigators or others who can facilitate access and decision-making.

Research from survivors underscores four critical skills in which advocacy improves decision making, including information-seeking, communication, problem-solving, and negotiation (Hoffman & Stovall, 2006). While patient advocacy groups can provide and encourage seeking information from providers about treatments, providers must also be involved in the planning the long-range aspects of cancer treatments. Health care providers can provide information about treatment options, enhance communication, and engage in shared decision-making with breast cancer patients to help explain both the clinical and non-clinical aspects of their treatment plan. For example, the Institute of Medicine Report issued a series of reports on cancer care that emphasized the need for patient advocacy across a range of issues. The 2006 IOM report recommended that all patients should have a “Survivorship Care Plan” developed by the primary provider of treatment in coordination with the patient (National Research Council, 2005).

Health insurance companies can also help inform members about their benefits and coverage policies around breast cancer treatments, including mastectomy and reconstruction, particularly to disadvantaged women. Low-income and less educated women are less likely to seek information about diagnosis and treatment and therefore access a narrower range of

sources compared to wealthier or more educated peers (Rutten, Arora, Bakos, Aziz, & Rowland, 2005). Finally, promoting greater patient involvement is consistent with the broad themes of health reform and patient-centered care; successfully engaging patients in their own care will likely enhance the capacity of health insurance coverage to address persistent racial/ethnic disparities in breast reconstruction after mastectomy.

Despite the contributions of this study, certain limitations remain. First, we do not know patient preferences, which may vary across cultural groups, and this is an important area for future research. Second, we cannot account for the volume of mastectomies performed or the availability of surgeons, which may influence breast reconstruction (Hershman et al., 2012). In sensitivity analyses, we pursued examination of the effect of surgeon density on reconstruction by linking to data on the number of plastic surgeons in the hospital county using the Area Health Resource File, a publicly available data set provided by the U.S. Bureau of Health Professions (US Department of Health and Human Services, 2013). However, this linkage is limited in two ways: 1) hospital county is a very crude measure of patient residence (some patients may drive long distances), and 2) we were unable to link data for 60% of our analytic sample. Nonetheless, our findings showed that the effects of race and insurance remained consistent in significance and the odds ratios were essentially unchanged. Future studies should examine how surgeon availability for reconstruction varies across insurance types and racial groups, and whether this impacts reconstruction rates.

Third, our analyses include only inpatient stays and do not capture outpatient care. However, mastectomies are less common in outpatient settings: using SEER data from 1998-2002, Bian et al. (2007) found that 4 % of outpatient mastectomies undergo reconstruction and 21 % of all reconstructions are outpatient procedures (Bian, Krontiras, & Allison, 2008). In comparison, 13 % of inpatient mastectomies stays undergo reconstruction, and 79 % of all reconstructions are inpatient. Our reconstruction codes identify the first stage in the multi-stage process. Findings from a statewide analysis of mastectomies in California indicated a much smaller rise in outpatient reconstruction than for inpatient reconstruction (Krupe et al., 2012). Finally, the NIS provides no information on the stage of breast cancer.

The benefits of insurance as it relates to the reconstruction differed by race, indicating the need for advocacy groups to actively promote education about barriers to minorities and providers alike. Future work should examine breast reconstruction by race and insurance, accounting for both structural barriers and patient preferences.

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References

- Agency for Healthcare Research and Quality. Overview of the nationwide inpatient sample (NIS). 2013. Retrieved August 23, 2013 <http://www.hcup-us.ahrq.gov/nisoverview.jsp>
- Albornoz CR, Bach PB, Pusic AL, McCarthy CM, Mehrara BJ, Disa JJ, et al. The influence of sociodemographic factors and hospital characteristics on the method of breast reconstruction, including microsurgery: A US Population–Based study. *Plastic and Reconstructive Surgery*. 2012; 129(5):1071–1079. [PubMed: 22544091]
- Alderman AK, Atisha D, Streu R, Salem B, Gay A, Abrahamse P, et al. Patterns and correlates of postmastectomy breast reconstruction by US plastic surgeons: Results from a national survey. *Plastic and Reconstructive Surgery*. 2011; 127(5):1796–1803. outcomes article. [PubMed: 21532409]
- Alderman AK, Hawley ST, Janz NK, Mujahid MS, Morrow M, Hamilton AS, et al. Racial and ethnic disparities in the use of postmastectomy breast reconstruction: Results from a population-based study. *Journal of Clinical Oncology*. 2009; 27(32):5325–5330. [PubMed: 19805680]
- Alderman AK, McMahon L, Wilkins EG. The national utilization of immediate and early delayed breast reconstruction and the effect of sociodemographic factors. *Plastic and Reconstructive Surgery*. 2003; 111(2):695–705. [PubMed: 12560690]
- Alegria M, Lin J, Chen C, Duan N, Cook B, Meng X. The impact of insurance coverage in diminishing racial and ethnic disparities in behavioral health services. *Health Services Research*. 2012; 47(3pt2): 1322–1344. [PubMed: 22568675]
- American Cancer Society. Cancer facts & figures 2013. Atlanta: American Cancer Society; 2013.
- Aranda MA, McGory M, Sekeris E, Maggard M, Ko C, Zingmond DS. Do racial/ethnic disparities exist in the utilization of high-volume surgeons for women with ovarian cancer? *Gynecologic Oncology*. 2008; 111(2):166–172. [PubMed: 18829086]
- Asgeirsson K, Rasheed T, McCulley S, Macmillan R. Oncological and cosmetic outcomes of oncoplastic breast conserving surgery. *European Journal of Surgical Oncology (EJSO)*. 2005; 31(8): 817–823.
- Bezuhly M, Temple C, Sigurdson LJ, Davis RB, Flowerdew G, Cook EF. Immediate postmastectomy reconstruction is associated with improved breast cancer-specific survival. *Cancer*. 2009; 115(20): 4648–4654. [PubMed: 19634163]
- Bian J, Krontiras H, Allison J. Outpatient mastectomy and breast reconstructive surgery. *Annals of Surgical Oncology*. 2008; 15(4):1032–1039. [PubMed: 18165916]
- Bird ST, Bogart LM. Perceived race-based and socioeconomic status(SES)-based discrimination in interactions with health care providers. *Ethnicity & Disease*. 2001; 11(3):554–563. [PubMed: 11572421]
- Brandberg Y, Malm M, Blomqvist L. A prospective and randomized study, “SVEA,” comparing effects of three methods for delayed breast reconstruction on quality of life, patient- defined problem areas of life, and cosmetic result. *Plastic and Reconstructive Surgery*. 2000; 105(1):66–74. [PubMed: 10626972]
- Case C, Johantgen M, Steiner C. Outpatient mastectomy: Clinical, payer, and geographic influences. *Health Services Research*. 2001; 36(5):869. [PubMed: 11666108]
- Charlson ME, Pompei P, Ales KL, MacKenzie CR. A new method of classifying prognostic comorbidity in longitudinal studies: Development and validation. *Journal of Chronic Diseases*. 1987; 40(5):373–383. [PubMed: 3558716]
- Christian CK, Niland J, Edge SB, Ottesen RA, Hughes ME, Theriault R, et al. A multi-institutional analysis of the socioeconomic determinants of breast reconstruction: A study of the national comprehensive cancer network. *Annals of Surgery*. 2006; 243(2):241. [PubMed: 16432358]
- Davis K, Abrams M, Kristof S. How the affordable care act will strengthen the nation's primary care foundation. *Journal of General Internal Medicine*. 2011; 26(10):1201–1203. [PubMed: 21523495]
- Dehal A, Abbas A, Johna S. Racial disparities in clinical presentation, surgical treatment and in-hospital outcomes of women with breast cancer: Analysis of nationwide inpatient sample database. *Breast Cancer Research and Treatment*. 2013; 139:561–569. [PubMed: 23690143]

- D'Hoore W, Bouckaert A, Tilquin C. Practical considerations on the use of the charlson comorbidity index with administrative data bases. *Journal of Clinical Epidemiology*. 1996; 49(12):1429–1433. [PubMed: 8991959]
- Duggal CS, Metcalfe D, Sackeyfio R, Carlson GW, Losken A. Patient motivations for choosing postmastectomy breast reconstruction. *Annals of Plastic Surgery*. 2013; 70(5):574–580. [PubMed: 23542859]
- Ganz PA, Desmond KA, Leedham B, Rowland JH, Meyerowitz BE, Belin TR. Quality of life in long-term, disease-free survivors of breast cancer: A follow-up study. *Journal of the National Cancer Institute*. 2002; 94(1):39–49. [PubMed: 11773281]
- Gerend MA, Pai M. Social determinants of black-white disparities in breast cancer mortality: A review. *Cancer Epidemiology Biomarkers & Prevention*. 2008; 17(11):2913–2923.
- Goel MS, Burns RB, Phillips RS, Davis RB, Ngo-Metzger Q, McCarthy EP. Trends in breast conserving surgery among asian americans and pacific islanders, 1992–2000. *Journal of General Internal Medicine*. 2005; 20(7):604–611. [PubMed: 16050854]
- Greenberg CC, Schneider EC, Lipsitz SR, Ko CY, Malin JL, Epstein AM, et al. Do variations in provider discussions explain socioeconomic disparities in postmastectomy breast reconstruction? *Journal of the American College of Surgeons*. 2008; 206(4):605–615. [PubMed: 18387464]
- Habermann EB, Abbott A, Parsons HM, Virnig BA, Al-Refaie WB, Tuttle TM. Are mastectomy rates really increasing in the united states? *Journal of Clinical Oncology*. 2010; 28(21):3437–3441. [PubMed: 20548000]
- Hasnain-Wynia, R.; Pierce, D.; Haque, A.; Hedges Greising, C.; Prince, V.; Reiter, J. Health research and educational trust disparities toolkit. 2012. Retrieved November 6, 2013, from <http://www.hret disparities.org/CollWhic-4171.php>
- Hernandez-Boussard T, Zeidler K, Barzin A, Lee G, Curtin C. Breast reconstruction national trends and healthcare implications. *The Breast Journal*. 2013; 19(5):463–469. [PubMed: 23758582]
- Hershman D, Richards C, Kalinsky K, Wilde E, Lu Y, Ascherman J, et al. Influence of health insurance, hospital factors and physician volume on receipt of immediate post-mastectomy reconstruction in women with invasive and non-invasive breast cancer. *Breast Cancer Research and Treatment*. 2012; 136(2):535–545. [PubMed: 23053659]
- Hoffman B, Stovall E. Survivorship perspectives and advocacy. *Journal of Clinical Oncology*. 2006; 24(32):5154–5159. [PubMed: 17093279]
- Hubbard AE, Ahern J, Fleischer NL, Van der Laan M, Lippman SA, Jewell N, et al. To GEE or not to GEE: Comparing population average and mixed models for estimating the associations between neighborhood risk factors and health. *Epidemiology*. 2010; 21(4):467–474. [PubMed: 20220526]
- Keating NL, Kouri E, He Y, Weeks JC, Winer EP. Racial differences in definitive breast cancer therapy in older women: Are they explained by the hospitals where patients undergo surgery? *Medical Care*. 2009; 47(7):765–773. [PubMed: 19536008]
- Kruper L, Xu X, Bernstein L. Disparities in reconstruction rates after mastectomy for ductal carcinoma in situ (DCIS): Patterns of care and factors associated with the use of breast reconstruction for DCIS compared with invasive cancer. *Annals of Surgical Oncology*. 2011; 18(11):3210–3219. [PubMed: 21863363]
- Lillie-Blanton M, Hoffman C. The role of health insurance coverage in reducing racial/ethnic disparities in health care. *Health Affairs*. 2005; 24(2):398–408. [PubMed: 15757923]
- Losken A, Carlson GW, Schoemann MB, Jones GE, Culbertson JH, Hester TR. Factors that influence the completion of breast reconstruction. *Annals of Plastic Surgery*. 2004; 52(3):258–261. [PubMed: 15156978]
- Martinez ME, Cohen RA. Health insurance coverage: Early release of estimates from the national health Interview survey, January-September 2012. National Center for Health Statistics. 2013
- Morrow M, Mujahid M, Lantz PM, Janz NK, Fagerlin A, Schwartz K, et al. Correlates of breast reconstruction. *Cancer*. 2005; 104(11):2340–2346. [PubMed: 16216000]
- National Research Council. From cancer patient to cancer survivor: Lost in transition. Washington DC: The National Academies Press; 2005.

- Nguyen AT, Chang DW. Discussion: A paradigm shift in US breast reconstruction: Increasing implant rates. *Plastic and Reconstructive Surgery*. 2013; 131(1):24–25. [PubMed: 23271516]
- Reaby LL. Reasons why women who have mastectomy decide to have or not to have breast reconstruction. *Plastic and Reconstructive Surgery*. 1998; 101(7):1810–1818. [PubMed: 9623821]
- Reuben BC, Manwaring J, Neumayer LA. Recent trends and predictors in immediate breast reconstruction after mastectomy in the united states. *The American Journal of Surgery*. 2009; 198(2):237–243.
- Rosson GD, Singh NK, Ahuja N, Jacobs LK, Chang DC. Multilevel analysis of the impact of community vs patient factors on access to immediate breast reconstruction following mastectomy in maryland. *Archives of Surgery*. 2008; 143(11):1076. [PubMed: 19015466]
- Rowland JH, Desmond KA, Meyerowitz BE, Belin TR, Wyatt GE, Ganz PA. Role of breast reconstructive surgery in physical and emotional outcomes among breast cancer survivors. *Journal of the National Cancer Institute*. 2000; 92(17):1422–1429. [PubMed: 10974078]
- Rubin LR, Chavez J, Alderman A, Pusic AL. ‘Use what god has given me’: Difference and disparity in breast reconstruction. *Psychology & Health*. 2013:1–22. ahead-of-print.
- Russo, A.; Milenkovic, M.; Steiner, C. Hospital stays for breast cancer, 2004. Rockville, MD: Agency for Healthcare Research and Quality; 2006. HCUP Statistical Brief #15 ed.
- Rutten LJF, Arora NK, Bakos AD, Aziz N, Rowland J. Information needs and sources of information among cancer patients: A systematic review of research (1980–2003). *Patient Education and Counseling*. 2005; 57(3):250–261. [PubMed: 15893206]
- Sisco M, Du H, Warner JP, Howard MA, Winchester DP, Yao K. Have we expanded the equitable delivery of postmastectomy breast reconstruction in the new millennium? evidence from the national cancer data base. *Journal of the American College of Surgeons*. 2012; 215(5):658–666. [PubMed: 22921327]
- Smedley, BD.; Stith, AY.; Nelson, AR., editors. Unequal treatment : Confronting racial and ethnic disparities in health care. Washington, D.C.: National Academy Press; 2003.
- StataCorp. StataSE. College Station, TX: StataCorp LP; 2012.
- Tseng JF, Kronowitz SJ, Sun CC, Perry AC, Hunt KK, Babiera GV, et al. The effect of ethnicity on immediate reconstruction rates after mastectomy for breast cancer. *Cancer*. 2004; 101(7):1514–1523. [PubMed: 15378473]
- US Department of Health and Human Services. Area health resources files (AHRF) 2012-2013. Rockville MD: Health Resources and Services Administration, Bureau of Health Professions; 2013.
- Williams E, Redhead S. Public health, workforce, quality, and related provisions in the patient protection and affordable care act (PPACA) No 7-5700). Congressional Research Services. 2010
- Wolfswinkel EM, Lopez SN, Weathers WM, Qashqai S, Wang T, Hilsenbeck SG, et al. Predictors of post-mastectomy reconstruction in an underserved population. *Journal of Plastic, Reconstructive & Aesthetic Surgery*. 2013
- Yang RL, Newman AS, Lin IC, Reinke CE, Karakousis GC, Czerniecki BJ, et al. Trends in immediate breast reconstruction across insurance groups after enactment of breast cancer legislation. *Cancer*. 2013
- Yang RL, Newman AS, Reinke CE, Lin IC, Karakousis GC, Czerniecki BJ, et al. Racial disparities in immediate breast reconstruction after mastectomy: Impact of state and federal health policy changes. *Annals of Surgical Oncology*. 2013; 20(2):399–406. [PubMed: 23054106]

Figure 1. Predicted Probability of Reconstruction, by Race and Insurance Type

Table 1
Descriptive Statistics of Women <65 Years Diagnosed with Breast Cancer Who Received a Mastectomy (with and without Reconstruction), 2002-2006

	Mast Only* (Count)	Mast Only (%)	Mast w/Rec* (Count)	Mast w/Rec (%)
<i>Demographic Characteristics</i>	<i>(N = 26, 448)</i>		<i>(N = 19,017)</i>	
Calendar year				
2002	6,436	24.33	21.60	4,107
2003	5,432	20.54	18.86	3,586
2004	5,010	18.94	21.02	3,997
2005	4,928	18.63	19.89	3,782
2006	4,642	17.55	18.64	3,545
Age Group				
55 to <65	11,854	44.82	27.17	5,167
45 to <55	9,449	35.73	42.03	7,992
<45	5,145	19.45	30.80	5,858
Insurance Category				
Private	18,170	71.84	91.14	16,895
Public	6,079	24.03	7.17	1,330
Uninsured	1,044	4.13	1.68	312
Race/Ethnicity				
White	13,475	70.11	82.99	11,585
Black	2,923	15.21	8.78	1,226
Hispanic	1,975	10.28	5.65	788
Asian	848	4.41	2.58	360
Any comorbidity	12,382	49.86	59.14	10,783
	12,453	50.14	40.86	7,450
Hospital Characteristics				
Teaching status of hospital				
Non-teaching	1,793	15.34	2,687	33.12
Teaching	9,892	84.66	5,426	66.88
Location (urban/rural) of hospital				
Rural	6,182	52.91	299	3.69
Urban	5,503	47.09	7,814	96.31
Region of hospital				
Northeast	2,228	19.07	1,827	22.52
Midwest	2,411	20.63	1,779	21.93
South	4,425	37.87	3,110	38.33
West	2,621	22.43	1,397	17.22
Bed size of hospital				
Small	1,630	13.95	961	11.85
Medium	2,795	23.92	1,637	20.18

	Mast Only* (Count)	Mast Only (%)	Mast w/Rec* (Count)	Mast w/Rec (%)
<i>Demographic Characteristics</i>	<i>(N = 26, 448)</i>		<i>(N = 19,017)</i>	
Large	7,260	62.13	5,515	67.98

* Mast Only = mastectomy only; Mast w/Rec = mastectomy with reconstruction.

Source: Author's analysis of the NIS, 2002-2006

Table 2
Descriptive Statistics of NIS Sample of Women <65 Years, Who Have Had a Mastectomy and Reconstruction for Breast Cancer, 2002-2006

	White			African American			Hispanic			Asian		
	Count	Mean (%)	SD	Count	Mean (%)	SD	Count	Mean (%)	SD	Count	Mean (%)	SD
Calendar year												
2002	5,862	42.19	0.49	887	26.16	0.44	566	27.56	0.45	274	22.26	0.42
2003	4,711	44.41	0.50	840	27.98	0.45	633	24.49	0.43	289	25.26	0.44
2004	5,151	50.63	0.50	915	32.13	0.47	538	27.88	0.45	244	34.02	0.48
2005	4,936	45.99	0.50	723	32.23	0.47	478	35.15	0.48	206	40.29	0.49
2006	4,400	48.68	0.50	784	29.59	0.46	548	29.01	0.45	195	30.77	0.46
Demographic Characteristics												
Age Group												
55 to <65	9,795	34.71	0.48	1,434	18.06	0.39	846	17.61	0.38	386	17.10	0.38
45 to <55	9,638	50.39	0.50	1,606	31.69	0.47	996	31.53	0.47	468	29.91	0.46
<45	5,627	59.14	0.49	1,109	41.30	0.49	921	35.29	0.48	354	43.50	0.50
Insurance Category												
Private	20,718	50.95	0.50	2,449	38.30	0.49	1,462	40.08	0.49	913	34.50	0.48
Public	3,069	20.50	0.40	1,307	15.84	0.37	850	15.18	0.36	213	12.68	0.33
Uninsured	557	26.75	0.44	175	20.57	0.41	229	17.47	0.38	50	22.00	0.42
Any comorbidity												
No	13,480	50.83	0.50	1,548	34.11	0.47	1,494	32.26	0.47	709	31.03	0.46
Yes	10,891	41.23	0.49	2,392	27.38	0.45	1,050	26.00	0.44	468	28.42	0.45
Hospital Characteristics												
Location (urban/rural)												
Rural	949	15.38%	0.36	124	9.68%	0.30	66	7.58%	0.27	28	0.00%	0.00
Urban	9,569	47.39%	0.50	1,704	29.93%	0.46	1,017	30.19%	0.46	533	25.70%	0.44
Teaching status												
Non-teaching	4,978	33.81%	0.47	619	17.29%	0.38	503	19.48%	0.40	265	15.85%	0.37
Teaching	5,540	54.12%	0.50	1,209	34.33%	0.48	580	36.90%	0.48	296	32.09%	0.47
Region												
Northeast	3,123	46.91%	0.50	333	32.73%	0.47	189	40.74%	0.49	97	37.11%	0.49
Midwest	1,464	41.26%	0.49	222	37.84%	0.49	13	30.77%	0.48	14	42.86%	0.51

	White		African American		Hispanic		Asian	
	Count	Mean (%)	Count	Mean (%)	Count	Mean (%)	Count	Mean (%)
South	3,799	45.12%	1,124	25.00%	518	32.24%	72	30.56%
West	2,132	42.12%	149	32.21%	363	17.63%	378	19.31%
Bed size								
Small	1,553	40.57%	164	37.20%	115	40.87%	58	24.14%
Medium	2,117	37.79%	541	20.15%	283	24.73%	107	19.63%
Large	6,848	47.47%	1,123	31.34%	685	28.47%	396	25.76%

SD= standard deviation. Source: Author's analysis of the NIS, 2002-2006.

Table 3
Adjusted Odd Ratios for Reconstruction, Among Women <65 years, 2002-2006

	AOR	95 % CI
Year	1.10***	1.04, 1.15
<i>Demographic Characteristics</i>		
Race/Ethnicity: (ref =white)		
African-American	0.57***	0.50, 0.64
Hispanic	0.70***	0.58, 0.85
Asian	0.45***	0.36, 0.56
Insurance: (ref=Private)		
Public	0.35***	0.30, 0.41
Uninsured	0.33***	0.24, 0.46
Age: (ref=55 to <65)		
45 to <55	1.60***	1.47, 1.75
<45	2.20***	1.96, 2.46
Any Comorbidity	0.84***	0.78, 0.91
<i>Hospital Characteristics</i>		
Urban	3.92***	2.48, 6.21
Teaching hospital	2.11***	1.65, 2.70
Region: (ref=Northeast)		
Midwest	0.83	0.58, 1.19
South	1.19	0.89, 1.59
West	0.92	0.63, 1.34
Bed size: (ref=Small)		
Medium	1.03	0.73, 1.45
Large	1.78***	1.31, 2.42

AOR = Adjusted odds ratios.

*
=p<.05,

**
p<.01

p<.001.

Source: Authors analysis of the NIS, 2002-2006.

Table 4
Adjusted Odd Ratios for Reconstruction, Among Women <65 years, by Insurance Type, 2002-2006

	A. Public Insurance		B. Private Insurance		C. Uninsured	
	AOR	95 % CI	AOR	95 % CI	AOR	95 % CI
Year	1.13*	1.02, 1.26	1.09**	1.03, 1.15	1.04	0.92, 1.18
<i>Demographic Characteristics</i>						
Race/Ethnicity: (ref =white)						
African-American	0.64*	0.45, 0.91	0.54***	0.47, 0.63	0.86	0.44, 1.70
Hispanic	0.89	0.60, 1.31	0.69***	0.56, 0.84	0.7	0.39, 1.27
Asian	0.35*	0.13, 0.97	0.44***	0.35, 0.56	0.78	0.32, 1.89
Age: (ref =55 to <65)						
45 to <55	1.73***	1.30, 2.31	1.57***	1.43, 1.72	2.56**	1.39, 4.70
<45	2.65***	1.93, 3.63	2.12***	1.87, 2.40	3.03***	1.66, 5.52
Any Comorbidity	1.03	0.82, 1.29	0.84***	0.77, 0.90	0.79	0.53, 1.17
<i>Hospital Characteristics</i>						
Urban	4.20***	1.98, 8.92	3.87***	2.41, 6.22	2.37	0.68, 8.33
Teaching	1.83**	1.25, 2.68	2.17***	1.69, 2.79	2.32*	1.15, 4.66
Region: (ref = Northeast)						
Midwest	0.68	0.34, 1.36	0.87	0.60, 1.26	1.12	0.50, 2.49
South	0.81	0.53, 1.23	1.25	0.93, 1.69	NA [^]	
West	0.49*	0.27, 0.89	0.96	0.66, 1.41	NA [^]	
Bed size: (ref=Small)						
Medium	0.63	0.34, 1.14	1.01	0.71, 1.44	3.56	0.66, 19.23
Large	1.19	0.70, 2.02	1.77***	1.29, 2.45	3.71	0.79, 17.42

[^] Northeast compared to other regions. NA= due to sample size limitations, we collapsed the Midwest, South and West regions for uninsured women.

* =p<.05,

** p<.01

*** p<.001.

AOR = Adjusted odds ratios

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