5-1-2019

An Analysis of Postmastectomy Breast Reconstruction Due to Breast Cancer in Nevada and the United States from 2008-2013

Jenna Webb
jennawebb5@gmail.com

AN ANALYSIS OF POSTMASTECTOMY BREAST RECONSTRUCTION DUE TO BREAST CANCER IN NEVADA AND THE UNITED STATES FROM 2008-2013

By

Jenna Webb

Bachelor of Science – Biology
University of Wisconsin, Platteville
2015

A thesis submitted in partial fulfillment
of the requirements for the

Master of Public Health

Department of Environmental and Occupational Health
School of Public Health
The Graduate College

University of Nevada, Las Vegas
May 2019

Thesis Approval

The Graduate College
The University of Nevada, Las Vegas

April 18, 2019

This thesis prepared by

Jenna Webb

entitled

An Analysis of Postmastectomy Breast Reconstruction Due to Breast Cancer in Nevada and the United States from 2008-2013

is approved in partial fulfillment of the requirements for the degree of

Master of Public Health
Department of Environmental and Occupational Health

Sheniz Moonie, Ph.D.
Examination Committee Chair

Chad Cross, Ph.D.
Examination Committee Co-Chair

Brian Labus, Ph.D.
Examination Committee Member

Jessica Word, Ph.D.
Graduate College Faculty Representative

Kathryn Hausbeck Korgan, Ph.D.
Graduate College Dean

Abstract

Background: In the United States, female breast cancer was the leading cause of new cancer cases from 2011-2015. Since the Women's Health and Cancer Act of 1998 (WHCRA), the federal government mandates employee and private health insurance providers to cover breast reconstruction if they cover mastectomies. Postmastectomy breast reconstruction (PBR) rates increased after the WHCRA, but these rates have remained relatively low throughout recent years. ***Objective:*** The objective of this study was to determine factors associated with women having PBR due to breast cancer in Nevada and the United States from 2008 to 2013. ***Methods:*** Using two HCUP database, NIS and SID databases, this study used complex multiple logistic regression and binary logistic regression to analyze the association between PBR and specific demographic, payer type, and hospital characteristics in the United States and Nevada. Weighted frequencies were calculated for the different breast reconstruction procedures and comorbidities that this study utilizes. ***Results:*** The results demonstrated that women who were younger, non-African American, had private health insurance, were in the high-income status category, and received care at an urban teaching hospital had higher odds of having PBR than other women. In Nevada and the United States, surgeons performed tissue expander insertions more than any other breast reconstruction procedure. The same nine comorbidities were prevalent among women in the United States and Nevada. ***Conclusion:*** Disparities among age, payer types, racial/ethnic groups, and socioeconomic status in PBR still exist in the United States. Nevada should consider implementing breast reconstruction education policies to decrease these disparities and policy makers should ensure that federally mandated education is available in multiple languages, as well as, representative of all of cultures.

Acknowledgements

I want to thank my co-chairs, Dr. Chad Cross and Dr. Sheniz Moonie, for their constant support, patience, and advice throughout my thesis. I'm grateful that they helped me find this project; without them, I don't think I would have finished my degree this semester.

I also wanted to thank Dr. Brian Labus and Dr. Jessica Word for giving their time to serve on my committee. I'm incredibly grateful to Dr. Labus for sticking with me through the many topic changes. I couldn't have made it through the semester without the emotional support and advice from Dr. Word.

I need to give a special thank you to Dr. Richard Baynosa and the UNLV School of Medicine Department of Plastic Surgery for the availability and use of the HCUP databases for my thesis. Also, I'd like to say thank you to Shelley Williams for helping me with any questions I had about HCUP databases, and for the enormous task of preparing the databases for my use.

I would also like to thank my former UW-Platteville advisor, Dr. Richard Dhyanchand, for encouraging me to follow the public health route, as well as, Dr. John Peterson for deciding to teach an epidemiology course to students that wouldn't have otherwise been exposed to public health. Without the two of you, I wouldn't have decided to get my Master of Public Health degree.

Lastly, to all my friends and family that have been there for me through this thesis journey, thank you so much. Your support means the world to me.

Table of Contents

List of Tables

Introduction

Female breast cancer was the leading cause of new cancer cases from 2011-2015, with an incidence rate of 124.7 new cases per 100,000 women in the United States. Over the past decade, breast cancer rates have stayed relatively constant between 121 and 125 new breast cancer cases per 100,000 females (U.S. Cancer Statistics Working Group, 2018). There was a 36% decrease in breast cancer death rates in the United States from 1989-2012. This decrease could be related to better prevention screenings (mammography and MRIs) and advancements in treatment options (American Cancer Society, 2015).

Mammectomies and mastectomies are the two primary surgical treatments for breast cancer. A mammectomy is a procedure that removes only the neoplasm (tumor) in the breast. It is considered a breast-conserving surgery and is also called a partial mastectomy, a lumpectomy, or a wide local excision (McGuire et al., 2009; American Cancer Society, 2015). A mammectomy followed by radiation has the same survival rates as a mastectomy for early-stage breast cancer. For this reason, mammectomy rates have increased in the past twenty years in the United States for all ages, races, and ethnicities (Hwang, Lichtensztajn, Gomez, Fowble, & Clarke, 2013). There are two main types of mastectomies, simple and radical. A radical mastectomy involves removal of the entire breast, areola, nipple, all levels of the axillary lymph nodes, and both pectoral muscles. Over the years, the radical mastectomy procedure has had modifications. The main difference is the preservation of pectoral muscles and level III axillary lymph nodes. Radical mastectomies are not common today; surgeons perform modified radical mastectomies instead. Another option is a simple mastectomy. This procedure removes breast tissue, areola, and the nipple. Mastectomies depend on the patients' stage and type of cancer and can be performed on one (unilateral) or both breasts (bilateral) (McGuire et al., 2009; Willey &

Manasseh, 2011). Just like mammectomy rates, mastectomy rates have been increasing. Hospital-based bilateral mastectomies due to cancer have increased threefold from 10 mastectomies to 29.7 mastectomies per 100,000 women between 2005 to 2013. In that same time range, inpatient mastectomy (all causes) rates doubled, while outpatient mastectomy (all causes) rates increased over fivefold (Steiner, Weiss, Barrett, Fingar, & Davis, 2016). The increased rates of these two surgical treatments have contributed to increased breast reconstruction rate as well (McGuire et al., 2009).

The Women's Health and Cancer Rights Act of 1998 (WHCRA) mandated employee and private health insurance providers to cover breast reconstruction in policies if they cover mastectomies. Mandates included covering the various stages of breast reconstruction, reconstruction of the uninflected breast for symmetry, and WHCRA is not limited to mastectomies due to cancer (Wong-Pan, 2012). State legislation began to pass laws that allowed Medicaid and Medicare to cover breast reconstruction. From 1998-2008, postmastectomy breast reconstruction (PBR) rates increased from 20.8% to 37.8% and advancements in breast reconstruction surgery contributes to increasing rates (Shippee, Kozhimannil, Rowan, & Virnig, 2014). Legislation has helped make reconstruction accessible, as well as, a vital part of breast cancer treatment for women (Liaw et al., 2013; Butler, Familusi, Serletti, & Fox, 2017).

A patient can either have postmastectomy breast reconstruction (PBR), which involves having reconstruction at the same time as a mastectomy or delay breast reconstruction (DBR) until another time. The decision to have PBR or to postpone it can be due to various reasons. Either patient's personal preference or receiving radiation may be reasons for them to wait to have breast reconstruction. Radiation can increase the chances of complications, like flap necrosis, implant exposure, and problems with tissue expanders (McCue, Miglior, &

Cunningham, 2010.) Despite these reasons, PBR has gained popularity over the years. From 2005-2012, PBR rates have increased by 50% (Kwok, Goodwin, Ying, & Agarwal, 2014).

Surgeons perform several different types of breast reconstruction today, but this study will only analyze certain procedures. Breast implants and tissue expanders have been used the longest for breast reconstruction and are the simplest reconstruction procedures. If there is enough tissue to cover the implant after a mastectomy, surgeons will insert a breast implant into a pocket they created under the pectoralis major muscle. If there is not enough tissue after a mastectomy, tissue expanders are placed into the pocket instead. After the surgery, expanders are filled with a saline solution over months (up to six months) until the desired size is achieved (McCue et al., 2010).

Autologous flaps are another breast reconstruction procedure. Surgeons use the patient's skin and tissue from another place on their body to reconstruct the breast(s). These flaps will result in a more natural breast than implants. The latissimus dorsi (LD) flap is a procedure where surgeons use part of the LD muscle, fat, tissue, and skin to reconstruct the breast(s). Implants, as well as, tissue expanders can be used with this flap procedure, and blood vessels remain attached to the original blood supply. (Boehmler & Butler, 2010). Another autologous flap is the transverse rectus abdominis myocutaneous (TRAM) flap. Surgeons use the rectus abdominis muscle, along with abdominal fat, skin, and blood vessels to reconstruct the breast(s). There are two versions of the TRAM flap this study will analyze: pedicle and free. TRAM pedicle is similar to the LD flap because the blood vessels stay connected to the original blood supply, while the TRAM free flap involves microsurgery that attaches the blood vessels to a new blood supply closer to the breast (Weiss, 2010; Liaw et al., 2013). The deep inferior epigastric artery perforator (DIEP) flap is a free flap procedure that evolved from the TRAM flap. It conserves the rectus abdominal muscles and only uses abdominal fat, tissue, and skin to reconstruct the breast(s). Just like the TRAM flap, the rectus abdominis is dissected to reach the blood vessels needed for the flap (Lipa, 2010). Another procedure that conserves the rectus abdominal muscles is the superficial inferior epigastric artery (SIEA) flap. This flap is similar to the DIEP flap, but the blood vessels needed for the flap are superficial to the rectus abdominal muscles, meaning those muscles are left undisturbed (Spiegel & Eldor, 2010). The gluteal artery perforator (GAP) flap is the last breast reconstruction procedure analyzed in this study. This procedure uses gluteal blood vessels instead of abdominal blood vessels and does not use any muscle in the flap. Two different arteries can be used, the inferior gluteal artery and the superior gluteal artery. The usage of either one depends on preferred scar position, distribution of fat, and if sizable blood vessels can be found. This procedure is usually used as an alternate when other autologous flaps will not work for the patient (Cheng & Huang, 2010).

Background and Significance

Mastectomies are an essential part of breast cancer treatment, but this procedure can have a negative impact on a woman's social, psychological, and sexual function (Veronesi et al., 2011; Platt, Baxter, & Zhong, 2011). A literature review reports that out of thirteen papers, most of them claimed that up to 50% of women reflected a lower body image than before their mastectomy (McGaughey, 2006). Al-Ghazal and coauthors (2000) concluded that 63% of their patients who had PBR did not lose their sense of sexual attractiveness, which they believe corresponds with sexual function. The researchers also suggest that patients who had PBR showed a lower level of distress than patients that had DBR (Al-Ghazal, Sully, Fallowfield, & Blamey, 2000). Breast reconstruction has shown to decrease the severity of negative impacts caused by a mastectomy, so it is essential for physicians to discuss breast reconstruction options with all patients (Morrow, Scott, Menck, Mustoe, & Winchester, 2001; Reuben, Manwaring, & Neumayer, 2009; Veronesi et al., 2009; McGuire et al., 2009).

PBR was an unpopular choice for breast cancer treatment historically. Initially, surgeons questioned whether PBR would affect detection of reoccurring breast cancer (Morrow et al., 2001; McGuire et al., 2009). Noone and colleagues (1993) reported that when patients had a reoccurrence of breast cancer, breast reconstruction did not affect detection and PBR did not increase reoccurrence rates (Noone et al., 1994). With the advancements in breast reconstruction mentioned already, these procedures do not interfere with detecting breast cancer reoccurrence (Atisha et al., 2008; Barnsley, Sigurdson, & Kirkland, 2008; Morrow et al., 2001; Reuben et al., 2009).

Three years after the WHCRA, PBR was recommended as an early-stage breast cancer treatment by the Commission on Cancer of the American College of Surgeons. After this happened, these rates rose (Platt et al., 2011). Yang and colleagues (2012) found that before policy changes, PBR rates were 18.5% in Pennsylvania, these rates nearly doubled between 2001 and 2004 to 32.7% (Yang et al., 2013). Even though PBR rates increased after policy changes, they remain relatively constant today (Platt et al., 2011; Reuben et al., 2009; Yang et al., 2013). Furthermore, several population-based studies found that between 2003 and 2007 only 25% to 35% of women have PBR in the United States (Morrow et al., 2014; Kruper et al., 2011; Alderman et al., 2009; Reuben et al. 2009). Researchers speculate several factors influence the breast reconstruction decision-making process, but they know little about the women having PBR (Morrow et al., 2001; Rueben et al., 2009).

Age is speculated to have a critical role in this decision-making process. It is believed that older women are not having breast reconstruction as often as younger women because they have more comorbidities that could affect the surgery (Platt et al., 2011). Despite this belief, Reuben and colleagues (2009) found that age was a factor for PBR after controlling for comorbidities (Rueben et al., 2009). The reasons why older women do not have PBR as often as younger women are still unknown. It could be due to personal preference or not being informed about their options by their physicians (Lipa, Youssef, Kuerer, Robb, & Chang, 2003).

Race and ethnicity are factors that can potentially influence a woman's decision to have PBR. A study that assessed the impact of the WHCRA on PBR rates found that the WHCRA did not eliminate the racial/ethnic disparities in PBR, even though that was the intent. Minority women were still less likely than white women to have PBR (Alderman, Wei, & Birkmeyer, 2006). A lack of breast reconstruction education for minorities and cultural differences in the value of women's breasts may be associated with these racial/ethnic disparities (Yang et al., 2013).

Socioeconomic status (SES) and payer type may potentially influence PBR rates. Barriers could exist for women with lower SES that don’t exist for women with higher SES regarding breast reconstruction, including lower education levels, not having a consultation with a reconstruction surgeon, seeing a physician that is not educated on breast reconstruction, and not having access to appropriate care (Morrow et al., 2001; Kruper et al., 2011). The influence from payer type, SES, and race combined may have more of an impact on the breast reconstruction decision-making process than if they were analyzed individually. More research is needed to understand the effect these factors have on breast reconstruction (Butler et al., 2018).

The location and type of the hospital a woman goes to can impact the breast reconstruction decision-making process. Urban hospitals have the ability for larger plastic surgery departments that can perform more types of breast reconstruction than rural hospitals can, which could be an advantage for patients (Kruper et al., 2011; Reuben et al., 2009). Along with urban hospitals, a few studies found that National Cancer Institute (NCI)-Designated Cancer Centers were 40% more likely to perform PBR than other hospital types (Morrow et al., 2001; McGuire et al., 2009). Research shows that both NCI-Designated Cancer Centers and teaching hospitals perform PBR more than nonteaching hospitals (Kruper et al., 2011; Reuben et al., 2009; Platt et al., 2011).

Significance and Objective

In a literature search for published studies on PBR, there were no studies to our knowledge specific to Nevada. State-specific data are needed to identify the populations having PBR in each state. Furthermore, Reuben et al. (2009) concluded that the published national data on PBR is outdated. The objective of this study is to determine factors associated with women having PBR due to breast cancer in Nevada and the United States from 2008 to 2013.

Research Questions

1. Which demographic variables are associated with PBR due to breast cancer in Nevada and the United States?
   - H_0= There are no demographic variables associated with PBR due to breast cancer in Nevada and the United States.
   - H_A= There are demographic variables associated with PBR due to breast cancer in Nevada and the United States.
2. Does the location and the teaching status of the hospital affect whether a woman has PBR due to breast cancer in the United States?
   - H_0= There is no difference in the location and teaching status of hospitals with women who had PBR compared to women who did not have breast reconstruction after a mastectomy due to breast cancer in the United States.
   - H_A= There is a difference in the location and teaching status of hospitals with women who had PBR compared to women who did not have breast reconstruction after a mastectomy due to breast cancer in the United States.
3. Does payer type affect whether a woman has PBR due to breast cancer in the United States and Nevada?
   - H_0= There is no difference in payer types with women who had PBR compared to women who did not have breast reconstruction after a mastectomy due to breast cancer in the United States and Nevada.
   - H_A= There is a difference in payer types with women who had PBR compared to women who did not have breast reconstruction after a mastectomy due to breast cancer in the United States and Nevada.

4. Are there certain types of breast reconstruction performed more frequently during PBR due to breast cancer in Nevada and the United States?
    - H_0= There is no difference in the types of breast reconstruction performed during PBR due to breast cancer in Nevada and the United States.
    - H_A= There is a difference in the types of breast reconstruction performed during PBR due to breast cancer in Nevada and the United States.
5. Are there comorbidities that are more prevalent with PBR due to breast cancer in Nevada and the United States?
    - H_0= There are no differences in the prevalence of comorbidities between those with and without having breast reconstruction after a mastectomy due to breast cancer in Nevada and the United States.
    - H_A= There are differences in the prevalence of comorbidities between those with and without having breast reconstruction after a mastectomy due to breast cancer in Nevada and the United States.

Methodology

Databases

This study is a secondary analysis utilizing two Healthcare Cost and Utilization Project (HCUP) databases. The HCUP databases are a collection of several healthcare databases supported by the Agency for Healthcare Research and Quality (AHRQ). In the United States, this database contains a vast amount of longitudinal data on hospital care, including "all-payer" data. HCUP was initiated in 1988 and was designed to improve hospital care by providing a potent source of national, state, and "all-payer" information for organizations to use (Healthcare Cost and Utilization Project [HCUP], 2018[a]). It is important to note HCUP uses *discharge record* as the unit, not individual patients (HCUP, 2018[c]).

The National (Nationwide) Inpatient Sample (NIS) is an HCUP database that contains data on inpatient care in the United States. The NIS database represents approximately 97% of US hospital discharges (only short-term, non-Federal hospitals) regardless of the payer type, resulting in an available sample of several million discharge records per year (HCUP, 2018[b]). In 2012, the NIS database changed from the Nationwide Inpatient Sample to the National Inpatient Sample. The name change was due to improvements made to the database, the most crucial being sample design. The new NIS database receives discharge records from all HCUP hospitals rather than from a sample of hospitals. All changes were made to reduce sampling error and more precise estimates (HCUP, 2018[c]).

The State Inpatient Databases (SID) contain all inpatient records (clinical and nonclinical information) for states that choose to participate. It differs from the NIS database because the NIS database is a sample of discharge records in the United States, while the SID databases include discharge records from states that participate. The SID databases are essential for obtaining estimates for individual states since the NIS database was not designed for such analyses (HCUP, 2018[c]).

Study Population

The NIS and the SID databases were used to identify discharge records of female breast cancer patients between the ages of 18 and 90 years who had a mastectomy between 2008 and 2013 in both Nevada and the United States. Participant's breast cancer diagnosis and mastectomy type were determined based on the International Classification of Diseases, ninth revision (ICD-9) (Table 1 & Table 2).

Table 1. ICD-9 Diagnosis Codes for Breast Cancer

Code	Procedure
174	Malignant neoplasm nipple
174.1	Malignant neoplasm breast-central
174.2	Malignant neoplasm breast up-inner
174.3	Malignant neoplasm breast low-inner
174.4	Malignant neoplasm breast up-outer
174.5	Malignant neoplasm breast low-outer
174.6	Malignant neoplasm breast-axillary
174.8	Malignant neoplasm breast NEC (Malignant neoplasm of other specified sites of female breast)
174.9	Malignant Neoplasm Breast NOS (Malignant Neoplasm of breast (female) unspecified)
233	Carcinoma in situ of breast
238.3	Neoplasm of uncertain behavior of breast
239.3	Neoplasm of unspecified nature of breast

Table 2. ICD-9 Procedure Codes for Mastectomy

Code	Procedure
85.33	Unilateral subcutaneous mammectomy with synchronous implant
85.34	Other unilateral subcutaneous mammectomy
85.35	Bilateral subcutaneous mammectomy with synchronous implant
85.36	Other bilateral subcutaneous mammectomy
85.4	Mastectomy
85.41	Unilateral simple mastectomy
85.42	Bilateral simple mastectomy
85.43	Unilateral extended simple mastectomy
85.44	Bilateral extended simple mastectomy
85.45	Unilateral radical mastectomy
85.46	Bilateral radical mastectomy
85.47	Unilateral extended radical mastectomy
85.48	Bilateral extended radical mastectomy

Variables

The dependent variable derived from the data represented breast reconstruction status (RECON). RECON was determined by eleven different ICD-9 breast reconstruction procedure codes (Table 3). It is a dichotomous variable with 1= having breast reconstruction and 0= not having breast reconstruction. In this study, twenty-nine comorbidity variables were used to create a comorbidity indicator variable that was used as a covariate in the multiple logistic regression models (SUMCMBS; Table 4). SUMCMBS is the sum of the twenty-nine variables, and it is continuous.

Table 3. ICD-9 Procedures Codes that Create RECON

Code	Procedure
85.53	Unilateral breast implant
85.54	Bilateral breast implant
85.95	Insertion of breast tissue expander
85.71	Latissimus dorsi myocutaneous flap
85.72	Transverse rectus abdominis myocutaneous flap, pedicled
85.73	Transverse rectus abdominis myocutaneous flap, free
85.74	Deep inferior epigastric artery perforator (DIEP) flap, free
85.75	Superficial inferior epigastric artery (SIEA) flap, free
85.76	Gluteal artery perforator (GAP) flap, free
85.7	Total Reconstruction of Breast
85.79	Other total reconstruction of breast

Table 4. List of Comorbidities that Creates SUMCMBS

Variable Name	Description
CM_AIDS	Acquired immune deficiency syndrome
CM_ALCOHOL	Alcohol abuse
CM_ANEMDEF	Deficiency anemias
CM_ARTH	Rheumatoid arthritis/collagen vascular diseases
CM_BLDLOSS	Chronic blood loss anemia
CM_CHF	Congestive heart failure
CM_CHRNLUNG	Chronic pulmonary disease
CM_COAG	Coagulopathy
CM_DEPRESS	Depression
CM_DM	Diabetes
CM_DMCX	Diabetes with chronic complications
CM_DRUG	Drug abuse
CM_HTN_C	Hypertension (combine uncomplicated and complicated)
CM_HYPOTHY	Hypothyroidism
CM_LIVER	Liver disease
CM_LYMPH	Lymphoma
CM_LYTES	Fluid and electrolyte disorders
CM_METS	Metastatic cancer
CM_NEURO	Other neurological disorders
CM_OBESE	Obesity
CM_PARA	Paralysis
CM_PERIVASC	Peripheral vascular disorders
CM_PSYCH	Psychoses
CM_PULMCIRC	Pulmonary circulation disorders
CM_RENLFAIL	Renal failure
CM_TUMOR	Solid tumor without metastasis
CM_ULCER	Peptic ulcer disease excluding bleeding
CM_VALVE	Valvular disease
CM_WGHTLOSS	Weight loss

Several purportedly important predictors were utilized for modeling. Four out the five independent variables were categorical in this study. The HCUP databases were obtained initially with categorized variables. In the SID database, age (AGE1) was separated into three groups; 18-40 years old, 41-64 years old, and 65-90 years old, while in the NIS data models, age (AGE1) was grouped by decades except for two groups; 18-29 years old and 80-90 years old. Payer type (PAYERTYPE) was categorized into six different categories for both databases; 1= Other 2= No charge 3= Medicare 4= Medicaid 5= Self-pay 6= Private insurance. In the NIS database, the private insurance category included private HMOs and PPOs, commercial carriers, and Blue Cross. The other category was defined as government programs including Worker's Compensation, CHAMPUS (TRICARE) and CHAMPVA, and Title V. CHAMPVA and TRICARE are two military healthcare programs that serve active duty members and retired members, their families, and veterans (Benefits.gov, n.d). Title V is a federal grant program focused on providing a wide variety of health care to mothers and children with barriers to quality health care (Health Resources & Services Administration [HRSA], 2019). In the SID database, Worker's Compensation was included in the private health insurance category until 2012 where it was moved to the other category (HCUP, 2018[d]). Race (RACE1) was grouped into six categories for the NIS database; 1= Other 2= Native American 3= Asian or Pacific Islander 4= Hispanic 5= White, 6= African American. For the SID database though, race (RACE1) was categorized into two groups; white and nonwhite. Median household income for patient's zip code (ZIPINC_QRTL) was grouped into quartiles based on median income by year (Table 5); 1= 0-25th percentile (low-income) 2= 26th-50th percentile (low/middle-income) 3= 51st-75th percentile (high/middle-income) 4= 76th-100th percentile (high-income). The variable for hospital location and teaching status (HOSP_LOCTEACH) had three categories; 1= Rural 2=

Urban nonteaching 3= Urban teaching. This variable combines hospital location and teaching status into one variable. The individual variables for location (HOSP_LOCATION) and teaching status (HOSP_TEACH) were discontinued in 2011 and thus were not used in this study. The SID database, however, does not include variables to analyze hospital location or hospital teaching status, and therefore the state-based models will not contain HOSP_LOCTEACH (HCUP, 2018[d]).

Table 5. Quartile Ranges for ZIPINC_QRTL by Year

Year	Quartile 1	Quartile 2	Quartile 3	Quartile 4
2008	1 - 38,999	39,000 - 48,999	49,000 - 63,999	64,000+
2009	1 - 39,999	40,000 - 49,999	50,000 - 65,999	66,000+
2010	1 - 40,999	41,000 - 50,999	51,000 - 66,999	67,000+
2011	1 - 38,999	39,000 - 47,999	48,000 - 63,999	64,000+
2012	1 - 38,999	39,000 - 47,999	48,000 - 62,999	63,000+
2013	1 - 37,999	38,000 - 47,999	48,000 - 63,999	64,000+

Data Preparation

The NIS and SID databases includes many diagnosis and procedure codes, making these databases extensive and complex (HCUP, 2018[a]). A solution to this complexity was to remove all discharge records that did not include any of the twelve breast cancer codes listed in Table 1 and any of the thirteen mastectomy codes in Table 2 from the two databases. The removal of these discharge records resulted in the final dataset that was utilized for analyses. In addition, discharge records for women who were not between the ages of 18 and 90 years old were removed from both databases as well.

When reviewing these datasets, the discharge records showed some women having multiple breast reconstruction procedures during the same surgery. This study was concerned with whether a woman did or did not have breast reconstruction and not with the total quantity of breast reconstruction procedures they had. The RECON variable was created to accommodate this. There were fifteen procedure variables (PR1-15) in the NIS database and twenty-five in the SID database. These procedure variables were recoded into RECON1-15 for the NIS database and RECON1-25 for the SID database. RECON1-25 categorized the ICD-9 breast reconstruction codes (Table 3) from 1 through 11, removing procedure codes that were not the breast reconstruction codes in the study. The sum of these variables was computed into SUMRECON. SUMRECON was then recoded into RECON, which defined reconstruction as a “1” and no reconstruction as a “0”.

This study controlled for whether a woman had comorbidities or not, but a variable had to be created from the two databases to define it. The sum of the twenty-nine variables listed in Table 4 was computed into one variable called SUMCMBS, which was a continuous, count variable. The NIS and SID databases had the same twenty-nine comorbidity variables.

Indicator variables were created for several of the independent variables to ensure that the reference group would be the highest value in all the independent variables. All new category descriptions were defined in the ‘Variables’ section of the methods. The first indicator variable was AGE1. AGE1 was created by recoding AGE, a continuous variable, into seven categories. The SID database sample size was too small to use seven categories, so it was separated into three categories instead. In the NIS database, the ‘40-49 years old’ category is the reference group and the ’41-64 years old’ category is the reference group for the SID database. The second indicator variable was RACE1. The variable RACE was recoded from 1= White 2= African

American 3= Hispanic 4= Asian or Pacific Islander 5= Native American, and 6= Other to have the 'African American' category be the reference group for the NIS database. Originally, the 'White' category was the reference group for the NIS database, but the 'African American' category reference group yielded interesting results. The variable RACE was recoded into RACE1 differently for the SID database to accommodate for sample size, and the 'nonwhite' category was the reference group. The last indicator variable is PAYERTYPE. PAY1 was recoded from 1= Medicare 2= Medicaid 3= Private insurance 4= Self-pay 5=No charge 6= Other to set the 'Private insurance' category as the reference group. All data preparation was completed using IBM SPSS Statistics 25 Syntax Editor.

Statistical Analyses

Discharge records from the NIS database were obtained using a design-based complex sample which incorporates complex weighting to produce accurate national estimates. The HCUP database provides a weighting variable called discharge weight (DISWT) (HCUP, 2015). DISWT was applied to the NIS database by creating a complex sample plan. All analyses and frequencies performed for the NIS database used this complex plan as the dataset. The SID data, on the other hand, did not require a weight variable and therefore, did not need to have a complex sample plan.

The NIS data were analyzed using IBM SPSS Statistics 25 Complex Samples, while the SID data were analyzed using IBM SPSS Statistics 25 Software. The statistical analysis for this study was based on the methods used by Reuben and coauthors (2009) in a study that analyzed predictors of PBR using NIS data from 1999 to 2003 (Reuben et al., 2009). The significance level was set to a $p < 0.05$ with a confidence level of 95% for all regression models.

For research questions 1 through 3, complex samples logistic regression models were produced for the individual independent variables for each year for the NIS data (30 models in total) and binary logistic regression models were created for the independent variables for the SID data (four models in total). CMBS was not used as a covariate in the individual logistic regression models. These models were created to analyze the association between each independent variable and the dependent variable, RECON. After these models were produced, independent variables were added into a model together. The NIS data produced six complex samples multiple logistic regression models that represented each year of the database. These models included two interaction variables. The first interaction was RACE1 and HOS_LOCTEACH and the other was RACE1 and ZIPINC_QRTL. Six multiple binary logistic regression models were created for the SID data representing each year occurring in the database. Since HOSP_LOCTEACH was not a variable available in the SID database, these models only included RACE1 and ZIPINC_QRTL as an interaction variable.

Unfortunately, due to the small sample size of PBR, models of the SID database could not be separated by individual years and therefore had to be created for the entire dataset. It should be noted that a small sample size can inflate the odds ratios and increase the associated confidence intervals. Variables were kept in the model even if they were not significant. There are known relationships between the independent variables, chosen for this study, and breast reconstruction outcomes. The interactions are important to keep in the models because there are also known relationships between race and SES, as well as, race and hospital characteristics with breast reconstruction outcomes (Reuben et al., 2009; Platt et al., 2011; Shippee et al., 2014; Kruper et al., 2011). Lastly, year trends were not calculated in this study. The change in the NIS database sample design in 2012 made it difficult to produce trend analyses across all the years.

Research question 4 and 5 were not analyzed by creating logistic regression models. Frequencies were calculated for each year for the eleven categories in RECON1-15 for the NIS data. The frequencies of the eleven categories in RECON1-25 were calculated for the entire SID database. It is worth noting that women could have multiple breast reconstruction procedures performed in the same surgery, meaning these frequencies represent how many procedures were performed each year, not how many women got these breast reconstruction procedures. To determine if specific comorbidities were prevalent in the study populations at least 10% of the study population would need to have the comorbidity in question. Frequencies were calculated for the twenty-nine comorbidity variables based on breast reconstruction status for each database.

Ethical Considerations

Any identifying information was removed by AHRQ before the two HCUP databases were received. AHRQ requires researchers to complete the HCUP Data Use Agreement Training before using any HCUP database. The author's completion certificate can be found in Appendix B. A research proposal that included this study was submitted for review to the UNLV School of Medicine Internal Review Board (IRB). This board decided that the research proposal was exempt from IRB review (Appendix C).

Results

The NIS Database: United States Results

In the United States, a total of 1,216,214 women between the ages of 18 to 90 years old had a mastectomy due to breast cancer between 2008 and 2013. Out of that population, 179,923 women had PBR. The PBR rates for each year were 11.2%, 14.3%, 15.4%, 15.8%, 16.3%, and 15.9%, respectively. The maximum number of comorbidities women had in this population were thirteen. Women who had PBR experienced one or no comorbidities 74.8% of the time, while the women who did not have breast reconstruction had one or no comorbidities 29.9% of the time. The median ages were 51.7 years old for women who had PBR and 63.2 years old for women who did not have breast reconstruction. This population was predominately white, went to an urban teaching hospital, and had private insurance, regardless of reconstruction status. The high-income quartile represented 42.1% of the PBR population, while 13.5% of the PBR population was in the low-income quartile. For the no reconstruction population, the low-income quartile had the highest percentage of women in it with 27.1%, while the high-income quartile had the lowest percentage with 23.4% of the women. The results for the number of comorbidities experienced in the United States is in Table 6. Demographic frequencies for the overall United States model can be found in Table 7, while demographic frequencies for individual years are in Appendix A, Table 8.

Table 6. Number of Comorbidities Experienced in the United States

Number of comorbidities	Reconstruction n(%)	No reconstruction n(%)	Total n(%)
0	79,368(44.1)	94,031(9.1)	173,399(14.3)
1	55,272(30.7)	195,117(18.8)	250,389(20.6)
2	28,471(15.8)	226,364(21.8)	254,835(21.0)
3	11,218(6.2)	201,065(19.4)	212,283(17.5)
4	4,000(2.2)	145,587(14)	149,587(12.3)
5	1,189(0.7)	87,785(8.5)	88,974(7.3)
6	302(0.2)	47,803(4.6)	48,104(4.0)
7	78(0)	23,400(2.3)	23,478(1.9)
8	15(0)	9,790(0.9)	9,805(0.8)
9	10(0)	3,695(0.4)	3,705(0.3)
10	0	1,221(0.1)	1,221(0.1)
11	0	321(0)	321(0)
12	0	87(0)	87(0)
13	0	26(0)	26(0)

Table 7. Demographic Frequencies for the Overall United States

Variable	Reconstruction n(%)	No reconstruction n(%)
Age		
Median age ± SD	51.7±10.5	63.2±14.0
18-29 years old	2,392(1.3)	5,746(0.60)
30-39 years old	18,156(10.1)	42,255(4.1)
40-49 years old	58,919(32.7)	139,712(13.5)
50-59 years old	57,414(31.9)	226,192(21.8)
60-69 years old	34,417(19.1)	262,849(25.4)
70-79 years old	7,980(4.4)	210,266(20.3)
80-90 years old	645(0.4)	149,272(14.4)
Race		
White	124,224(75.4)	642,415(69.4)
African American	16,265(9.9)	153,042(16.5)
Hispanic	12,259(7.4)	75,812(8.2)
Asian/Pacific	5,629(3.4)	25,446(2.7)
Native American	554(0.3)	4,202(0.5)
Other	5,756(3.5)	25,036(2.7)
Payer type		
Private Insurance	137,918(76.7)	349,298(33.8)
Self-pay	1,689(0.9)	19,869(1.9)
Medicaid	12,672(7.1)	129,635(12.5)
Medicare	22,877(12.7)	509,425(49.2)
No charge	347(0.2)	4,017(0.4)
Other	4,238(2.4)	22,327(2.2)
Household income status		
Low income	23,845(13.5)	274,519(27.1)
Low/middle income	32,058(18.2)	254,329(25.1)
High/middle income	46,224(26.2)	247,601(24.4)
High income	74,306(42.1)	237,167(23.4)
Hospital location/teaching status		
Rural	3,594(2.0)	118,033(11.5)
Urban nonteaching	56,624(31.7)	403,819(39.2)
Urban teaching	118,428(66.3)	507,118(49.3)

The independent variables, not controlling for comorbidities, were significant in the individual complex samples logistic regression models. However, the interaction between race (RACE1) and SES (ZIPINC_QRTL) was not significant for all the years in the complex samples multiple logistic regression models. P-values for this interaction are as follows from 2008 to 2013: 0.20, <0.001, 0.16, 0.31, 0.09, and 0.5, respectively. This interaction was not significant in the overall United States model. The interaction between race (RACE1) and hospital characteristics (HOSP_LOCTEACH) was not significant in 2011 (p-value=0.66) and 2013 (p-value=0.5) in the complex samples multiple logistic regression models, but it was significant in the overall United States model. In 2012, ZIPINC_QRTL was not significant (p-value=0.13) in that complex samples multiple logistic regression model. However, the six categories in PAYERTYPE remained significant over the years in this study and in the overall United States model. Results for the individual independent variable models are in Appendix A, Table 9, while results for individual years for the complex samples multiple logistic regression models can be found in Appendix A, Table 10.

In the overall United States complex samples multiple logistic regression model, women between the ages of 40 and 49 years old had higher odds of having PBR than any other age group. The 18-29 years old group was not significant during any of the years and remained not significant in the overall United States model (OR=1.01, CI[0.89-1.15]). African American women had lower odds of having PBR than women from any other race category in the overall United States model. The Asian and Pacific Islander and Native American categories were not significant in any of the models, except in 2009, with odds ratios of 0.55 (CI[0.37,0.82]) and

0.27 (CI[0.10,0.74]). Women with private insurance had higher odds of having PBR than women with any other payer type in the overall United States model. Women in the self-pay category had the lowest odds of having PBR out of the six different payer type categories compared to private insurance. Specifically, in 2011, the self-pay category had an odds ratio of 7.54 (CI[5.08,11.2]). Women in the high-income quartile had higher odds of having PBR than women in any other income quartile. Women who had a mastectomy at a rural hospital had lower odds of having PBR than women who had a mastectomy at an urban teaching hospital in the overall United States model (OR=9, CI[5.50,14.7]). Similarly, women who had a mastectomy at an urban nonteaching hospital had 1.42 lower odds of having PBR than women who had a mastectomy at an urban teaching hospital (CI[1.29,1.56]). All results for the individual year complex samples multiple logistic regression models are in Appendix A, Table 10, while results for the overall United States model is in Table 11.

Table 11: Complex Samples Multiple Logistic Regression for the Overall United States

Variable (reference group)	Odds ratio	95% C.I	P-value
Age (40-49 years old)			**<0.001**
18-29 years old	1.01	0.89-1.15	
30-39 years old	1.06	1.01-1.12	
50-59 years old	1.33	1.28-1.38	
60-69 years old	1.75	1.68-1.82	
70-79 years old	3.91	3.65-4.19	
80-90 years old	31.1	25.8-37.6	
Race (African American)			**<0.001**
White	0.64	0.58-0.71	
Hispanic	0.76	0.66-0.88	
Asian/Pacific	1.07	0.93-1.25	
Native American	0.85	0.50-1.44	
Other	0.68	0.57-0.80	
Payer type (private insurance)			**<0.001**
Self-pay	4.35	3.82-4.96	
Medicaid	3.02	2.87-3.17	
Medicare	1.97	1.88-2.06	
No charge	5.01	3.83-6.55	
Other	1.65	1.51-1.80	
Household income status (high income)			**<0.001**
Low income	1.85	1.65-2.07	
Low/middle income	1.48	1.31-1.69	
High/middle income	1.18	1.04-1.34	
Hospital location/teaching status (urban/teaching)			**<0.001**
Rural	9.00	5.50-14.7	
Urban nonteaching	1.42	1.29-1.56	

Out of the eleven breast reconstruction procedures (Table 3), the insertion of breast tissue expanders was performed 67.7% of the time in the overall United States model. The DIEP free flap procedure was performed the most out of the autologous flap procedures (6.6%), followed by the latissimus dorsi myocutaneous flap (5.7%). The SIEA free flap procedure was seldom used in this study (0.3%). Unilateral and bilateral breast implants were inserted equally. Frequencies for the breast reconstruction procedures for the overall United States and individual years can be found in Table 12.

Table 12. Breast Reconstruction Procedure Frequencies for the United States (individual years & total) and Nevada (total)

Year Reconstruction type	2008 n	2009 n	2010 n	2011 n	2012 n	2013 n	U.S. Total n(%)	Nevada Total n(%)
Unilateral breast implant	1,887	1,780	2,021	2,302	2,065	1,385	11,440(4.4)	80(7.6)
Bilateral breast implant	1,772	1,552	1,850	1,869	2,260	1,855	11,158(4.3)	128(12.1)
Insertion of breast tissue expander	24,189	26,880	30,850	33,068	31,198	30,940	177,125(67.7)	645(61.0)
Latissimus dorsi myocutaneous flap	638	2,483	2,476	3,124	3,015	3,070	14,806(5.7)	143(13.5)
TRAM flap, pedicled	657	2,399	2,123	2,107	1,665	1,225	10,176(3.9)	25(2.4)
TRAM flap, free	667	2,044	2,046	1,533	2,240	1,945	10,475(4.0)	10(0.95)
DIEP flap, free	473	3,168	2,264	3,912	3,640	3,745	17,202(6.6)	5(0.47)
SIEA flap, free	51	242	152	93	170	160	868(0.3)	1(0.09)
GAP flap, free	5	60	30	37	50	60	242(0.09)	0(0)
Total reconstruction of breast	108	698	541	397	455	555	2,754(1.1)	7(0.66)
Other total reconstruction of breast	110	647	890	1,054	1,306	1,455	5,462(2.1)	14(1.3)

There were twenty-nine comorbidities analyzed in this study (Table 4). Nine of these comorbidities were prevalent in the overall United States. Hypertension [reconstruction (R): 25.4%; no reconstruction (NR): 49.3%], hypothyroidism (R: 10.3%; NR: 13.4%) and metastatic cancer (R: 10.2%; NR: 29.1%) were prevalent regardless of reconstruction status. Deficiency anemias (19%), fluid and electrolyte disorders (23.7%), chronic pulmonary disease (14.9%), depression (11.7%), diabetes (18.3%), and solid tumors without metastasis (34.8%) were prevalent only in the population that did not have reconstruction. Results from the twenty-nine comorbidities can be found in Table 13.

Table 13. Comorbidity Frequencies for the United States and Nevada

Comorbidity type	U.S. Reconstruction n(%)	U.S. No reconstruction n(%)	Nevada Reconstruction n(%)	Nevada No reconstruction n(%)
Acquired immune deficiency syndrome	47(0)	776(0.1)	0	4(0.1)
Alcohol abuse	632(0.4)	9,671(0.9)	5(0.7)	60(0.9)
Deficiency anemias	**7068(3.9)**	**197,211(19)**	**21(2.9)**	**1602(24.0)**
Rheumatoid arthritis/collagen vascular diseases	2,414(1.3)	23,904(2.3)	5(0.7)	99(1.5)
Chronic blood loss anemia	503(0.3)	9,325(0.9)	1(0.1)	62(0.9)
Congestive heart failure	625(0.3)	65,645(6.3)	2(0.3)	354 (5.3)
Chronic pulmonary disease	**15,215(8.5)**	**154,566(14.9)**	**58(8.1)**	**1096(16.4)**
Coagulopathy	890(0.5)	58,956(5.7)	1(0.1)	560(8.4)
Depression	**15,991(8.9)**	**121,072(11.7)**	**49(6.9)**	**666(10)**
Diabetes	**11,075(6.2)**	**189,681(18.3)**	**40(5.6)**	**1101(16.5)**
Diabetes with chronic complications	497(0.3)	26,745(2.6)	0	97(1.5)
Drug abuse	481(0.3)	9,828(0.9)	3(0.4)	78(1.2)
Hypertension (combine uncomplicated and complicated)	**45,673(25.4)**	**510,952(49.3)**	**193(27)**	**3007(45.1)**
Hypothyroidism	**18,525(10.3)**	**139,273(13.4)**	**74(10.4)**	**965(14.5)**
Liver disease	770(0.4)	19,935(1.9)	2(0.3)	131(2)
Lymphoma	362(0.2)	5,898(0.6)	2(0.3)	36(0.5)
Fluid and electrolyte disorders	**3,250(1.8)**	**245,148(23.7)**	**7(1.0)**	**1765(26.5)**
Metastatic cancer	**18,291(10.2)**	**301,654(29.1)**	**54(7.6)**	**2012(30.2)**
Other neurological disorders	2,608(1.4)	52,173(5)	12(1.7)	354(5.3)
Obesity	12,166(6.8)	94,040(9.1)	56(7.8)	560(8.4)
Paralysis	188(0.1)	16,480(1.6)	1(0.1)	95(1.4)
Peripheral vascular disorders	598(0.3)	27,349(2.6)	1(0.1)	114(1.7)
Psychoses	1,952(1.1)	35,001(3.4)	4(0.6)	158(2.4)
Pulmonary circulation disorders	389(0.2)	22,966(2.2)	1(0.1)	164(2.5)
Renal failure	745(0.4)	64,052(6.2)	4(0.6)	344(5.2)
Solid tumor without metastasis	**4,940(2.7)**	**360,575(34.8)**	**18(2.5)**	**2254(33.8)**
Peptic ulcer disease excluding bleeding	14(0.0)	261(0.0)	0	5(0.1)
Valvular disease	4,127(2.3)	32,243(3.1)	11(1.5)	154(2.3)
Weight loss	344(0.2)	56,239(5.4)	0	427(6.4)

*Bolded comorbidities are prevalent in the United States and Nevada

The SID Database: Nevada Results

In Nevada, there were 7,382 women between the ages of 18 and 90 years old who had a mastectomy due to breast cancer between 2008 to 2013. Out of these women, 714 had PBR. The PBR rate was 9.7%. Women had a maximum of twelve comorbidities. Seventy-six percent of women who had PBR had one or no comorbidities, while 29.3% of women who did not have breast reconstruction had one or no comorbidities. The median ages were 52.6 years old for women who had PBR and 62.2 years old for women who did not have breast reconstruction. Out of the PBR population, 67.2% were between the ages of 41 and 64 years old, were predominately white, had private insurance, and represented the high/middle income or the high-income quartiles. The no reconstruction population was predominantly insured by Medicare (45.3%) more than by private insurance (39.5%). The number of comorbidities experienced in Nevada is in Table 14, while demographic frequencies for this database can be found in Table 15.

Table 14. The Number of Comorbidities Experienced in Nevada

Number of comorbidities	Reconstruction n(%)	No reconstruction n(%)	Total n(%)
0	345(48.3)	687(10.3)	1,032(14.0)
1	198(27.7)	1,265(19.0)	1,463(19.8)
2	106(14.8)	1,353(20.3)	1,459(19.8)
3	48(6.7)	1,250(18.7)	1,298(17.6)
4	15(2.1)	936(14.0)	951(12.9)
5	1(0.1)	612(9.2)	613(8.3)
6	1(0.1)	313(4.7)	314(4.3)
7	0	155(2.3)	155(2.1)
8	0	52(0.8)	52(0.7)
9	0	35(0.5)	35(0.5)
10	0	7(0.1)	7(0.1)
11	0	1(0)	1(0)
12	0	2(0)	2(0)

Table 15. Demographic Frequencies for Nevada

Variable	Reconstruction n(%)	No reconstruction n(%)
Age		
18-40 years old	106(14.8)	351(5.3)
41-64 years old	480(67.2)	3360(50.4)
65-90 years old	128(18.0)	2957(44.3)
Mean ± SD age	52.56 ±11.21	62.15 ±13.23
Race		
White	55(77)	4679(70.2)
African American	41(5.7)	796(11.9)
Hispanic	51(7.1)	453(6.8)
Asian or Pacific Islander	39(5.5)	398(6.0)
Native American	2(0.3)	33(0.5)
Other	20(2.8)	207(3.1)
Payer type		
Private Insurance	545(76.3)	2632(39.5)
Self-pay	7(1.0)	220(3.3)
Medicaid	24(3.4)	576(8.6)
Medicare	122(17.1)	3023(45.3)
No Charge	0(0.0)	14(0.2)
Other	15(2.1)	132(2.9)
Household income status		
Low income	67(9.4)	1058(15.9)
Low/middle income	133(18.6)	1508(22.6)
High/middle income	251(35.2)	2088(31.3)
High income	241(33.8)	1776(26.6)

The four independent variables were significant in the individual logistic regression models for Nevada, while ZIPINC_QRTL and the interaction between race (RACE1) and SES (ZIPINC_INC) was not significant in the multiple logistic model. Results from the individual logistic models can be found in Appendix A, Table 16 and results for the multiple logistic model can be found in Table 17.

Table 17. Multiple Logistic Regression Model for Nevada

Variable (reference group)	Odds ratio	95% C.I	P-Value
Age (41-64 years old)			**0.001**
18-40 years old	0.73	0.55-0.95	
65-90 years old	1.60	1.16-2.20	
Race (nonwhite)			**0.02**
White	0.65	0.45-0.93	
Payer type (private insurance)			**<0.001**
Self-pay	5.00	2.30-10.9	
Medicaid	3.62	2.32-5.65	
Medicare	1.90	1.37-2.62	
Other	1.85	1.05-3.25	
Household income status (high income)			**0.58**
Low income	1.30	0.74-2.29	
Low/middle income	1.80	0.77-2.10	
High/middle income	0.97	0.62-1.51	
Interaction of race and household income (nonwhite/high income)			**0.99**
White*low income	0.96	0.49-1.88	
White*low/middle income	0.92	0.52-1.64	
White*high/middle income	1.01	0.61-1.67	

In the multiple logistic regression model, women between the ages of 18 and 40 years older had 27% higher odds of having PBR compared to women between the ages of 41 and 64 years old. When looking at the women in the 65 to 90 years old category, though, the odds were 1.6 times lower for having PBR compared to women in the 41 to 64 years old category. White women had 35% higher odds of having breast reconstruction than nonwhite women. There were similarities with the overall United States when it came to payer type. Self-pay had the lowest odds ratio of having PBR compared to private insurance out of the payer type categories (OR=5.00, CI[2.30,10.9]). The other payer type category had 1.85 (CI[1.05,3.25]) times lower odds of having PBR compared to the private insurance category. Discharge records did not show 'no charge' as a payer type for women who had PBR in Nevada (Table 14). Therefore, an odds ratio could not be calculated. Other results from the multiple logistic regression model for Nevada can be found in Table 17.

Inserting tissue expanders was performed the most out of the eleven breast reconstruction procedures (61%). Out of the autologous flaps, the latissimus dorsi myocutaneous flap procedure was used at least five times as often as any other autologous flap (13.5%). The GAP free flap procedure was the only autologous flap procedure not performed in Nevada. Bilateral breast implants (12.1%) were inserted more frequently than unilateral breast implants (7.6%). Breast reconstruction procedure frequencies can be found in Table 12.

The same nine comorbidities were prevalent in Nevada that were prevalent in the United States. Hypertension (R:27%; NR:45.1%) and hyperthyroidism (R:10.4%; NR:14.5%) were prevalent in both the PBR and no reconstruction population, while deficiency anemias (24%), chronic pulmonary disease (16.4%), depression (10%), diabetes (16.5%), fluid and electrolyte disorders (26.5%), metastatic cancer (30.2%), and solid tumors without metastasis (33.8%) were prevalent in only the no reconstruction population. Frequencies for the twenty-nine comorbidities can be found in Table 13.

Discussion

Hospital Location and Teaching Status

In this study, 66.3% of women in the United States had PBR at an urban teaching hospital, while only 2% of that population had PBR at a rural hospital. Out the women who did not have PBR, 11.5% of the women had a mastectomy at a rural hospital, while 49.3% of these women had a mastectomy at an urban teaching hospital (Table 7). Women who had a mastectomy at a rural or an urban nonteaching hospital had lower odds of having PBR compared to women who had a mastectomy at an urban teaching hospital (Table 11). These results are consistent with other researchers' findings (Reuben et al., 2009; Kruper et al., 2011; Platt et al., 2011).

The plastic surgeon's location could partially explain why PBR is performed more at urban teaching hospitals compared to rural hospitals. Plastic surgeons are not distributed equally between urban and rural hospital settings. As of 2015, there were 53 plastic surgeons in Nevada with 42 of them residing in Southern Nevada, 11 in Northwestern Nevada and zero plastic surgeons in Northeastern Nevada (Griswold, Gunawan, & Packham, 2018). It is known that teaching hospitals and hospitals in urban areas can support surgical teams who perform difficult breast reconstruction procedures better than hospitals in rural areas (Kruper et al., 2011; Berlin, Wilkins, & Alderman, 2018). One study analyzed the relationship between plastic surgeon density in small geographic areas and breast reconstruction rates in 10 states. The researchers found that approximately half of the variation in breast reconstruction rates (delayed and immediate) between urban and rural areas could be explained by the density of plastic surgeons per people during 2010 (Bauder et al., 2017).

Additionally, PBR rates can be negatively impacted by how difficult it is to coordinate the schedules of plastic and general surgeons to perform PBR at rural hospitals (Rubin, Chavez, Alderman, & Pusic, 2013; Berlin, 2018; Bauder et al., 2017). In the United States, more plastic surgeons who perform PBR are needed to increase the access of these procedures in rural areas and, in general, to fill the void of the large number of retiring plastic surgeons (Noone, Goldwyn, McGrath, Spear, & Evans, 2007). Several studies suggested that allowing general surgeons to perform breast reconstruction procedures, instead of only mastectomies, would help increase access to PBR. This concept has worked internationally in other medical fields, such as otolaryngology (Berlin et al., 2018; Bauder et al., 2017; Winters, Pou, & Friedlander, 2011). Limited access to PBR in rural areas has the potential to negatively affect the 274,622 Nevadans living in rural Nevada (Rural Health Information Hub [RHIhub], 2019). This study could not assess the relationship between rural hospitals in Nevada and PBR rates due to the unavailability of a hospital location variable or a similar variable in the SID database.

In addition to the reasons stated above, living in specific regions of the United States can positively impact PBR rates. Reuben et al. (2009) concluded, between 1999 and 2003, women who received care in the South had increased odds of having PBR than women who received care in the Midwest, Northeast, or the West. The authors mentioned that PBR was first established in hospitals in the South, which increased the number of plastic surgeons available there (Reuben et al., 2009). An older study found different results though. Women in the South and the Midwest were less likely to have PBR compared to the Mountain and Pacific regions during 1994-1995 (Morrow et al., 2001). Hospital region was not analyzed as an independent factor for PBR because this study was concerned with the United States, as a whole, and Nevada.

Delayed and Outpatient Breast Reconstruction

Between 2008 and 2013, PBR rates in the United States ranged from 11.2%-15.9%, while the PBR rate in Nevada was 9.7% in this study. United States PBR rates have decreased roughly 10% since 2003 (25.3%) when using data obtained by the NIS database (Reuben et al., 2009). The cause of decreasing PBR rates in the NIS database is not entirely understood.

Increasing outpatient breast cancer treatment surgeries could provide an explanation, but there is conflicting information in the literature. According to a study that analyzed data from 28 states via SID databases and State Ambulatory Surgery and Services Databases (SASD), outpatient mastectomies accounted for 43% of all mastectomy surgeries in 2012 (Steiner et al., 2016). In contrast, a study that used Californian data found that outpatient mastectomy rates (20.4% to 23.9%) did not increase as much as inpatient mastectomy rates (29.2% to 41.6%) during 2006-2009. Moreover, the authors concluded that while outpatient PBR rates increased from 7.7 to 10.3%, inpatient PBR was more popular, and the rates increased from 29.2% to 41.6% (Kruper et al., 2011). Bauder et al. (2017) found that in their study population only 15.5% of the women received a mastectomy in an outpatient setting and their overall (immediate and delayed) breast reconstruction rate was 44.7% (Bauder et al., 2017). Another study that used SID databases and SASD found that inpatient PBR rates remained constant during 2009-2014 (7.4 to 7.3 per 100,000 women), while outpatient PBR rates increased by 155% (1.1 to 2.8 per 100,000 women). Even though there was an increase in outpatient PBR rates during this study, PBR was performed in an inpatient setting more (Miller, Steiner, Barrett, Fingar, & Elixhauser, 2017).

Like outpatient breast cancer treatment surgeries, DBR rates have increased over the years. One study found a 10.1% increase in DBR from 2009 to 2014 in 22 states. Specifically, in 2014, 71% of the overall breast reconstruction rate was from DBR procedures (Miller et al., 2017). Those results are different from a study that analyzed data from the Mastectomy

Reconstruction Outcomes Consortium (MROC) from 2012 to 2015. This study resulted in only 7.7% of the study population choosing to have DBR. The authors found that women who needed radiation therapy, in conjunction with a mastectomy, had lower complication rates if they waited to have breast reconstruction until after their treatment was completed (Yoon et al., 2018). DBR is more popular in older women who have several comorbidities, and in women who live in rural areas. Even though DBR has been shown to have lower complication rates for specific procedures, like autologous flaps, plastic surgeons still prefer to perform PBR when possible (Bauder et al., 2017; Yoon et al., 2018).

Breast Reconstruction Procedures

The most popular breast reconstruction procedure was the insertion of breast tissue expanders in the United States and Nevada (Table 12). During breast reconstruction, surgeons may use tissue expanders, in combination, with other procedures, explaining the large number of tissue expander insertion in this study (McCue et al., 2010; Boehmler & Butler, 2010). When examining the use of breast implants, Nevadan surgeons inserted breast implants more often (19.6%) than surgeons in the United States did (8.7%). U.S. surgeons performed autologous flap procedures 20.59% of the time, while 17.4% of the time, Nevadan surgeons performed autologous flap procedures.

Although this study only analyzed the frequencies of breast reconstruction procedures, there are known relationships between different subpopulations of women and specific breast reconstruction procedures. Women 35 years old and younger, and, women between the ages of 65 and 74 years old preferred having breast implants over any other procedures (Alderman, McMahon, & Wilkins, 2003; Butler et al., 2016). African American women prefer having autologous flap procedures more than having breast implants (Rubin et al., 2013). Lastly, women who had DBR were more likely to have an autologous flap procedure than any other reconstruction options (Yoon et al., 2018).

Comorbidities

The same nine comorbidities were prevalent in the United States and Nevada in this study. On average, women who did not have breast reconstruction had more comorbidities than women who had PBR. This finding is consistent with other results about comorbidities in the literature. Several studies concluded that women with multiple medical conditions were less likely to have breast reconstruction than other women, or at least have more post-surgical complications (Yoon et al., 2018; Kruper et al., 2013; Veronesi et al., 2011). Butler et al. (2016) found that moderately obese women (30-34.9 kg/m^2) had 1.46 higher odds (p-value= <0.001) of having post-surgical complications than women who were not obese (<30 kg/m^2). The complications reported in this study were minor, like wound infection and breast implant failures. Though this study stated that morbidly obese women were more likely to have major complications than other women, it was determined that age and race were not independent predictors of post-surgical complications. Other comorbidities, such as cardiovascular disease and smoking, increased the odds of having complications after surgery (Butler et al., 2016). Lastly, physicians are less likely to discuss breast reconstruction options with women who have several comorbidities due to the increased risk of additional surgery (Veronesi et al., 2011).

Age

The median age of women having PBR has not changed for the United States since 2003 (Reuben et al., 2009). Median ages for women having PBR in Nevada and the United States were similar (Table 7 & Table 15). When age was analyzed in the individual logistic regression model, the gap between older and younger women having PBR was larger than the gap in the multiple logistic regression model for both the United States and Nevada (Table 9; Table 11; Table 16; Table 17). There are several possible explanations for this gap increase, one could be that women who did not have PBR had more comorbidities than younger women in this study. Even when comorbidities were considered, older women do not have PBR as often as younger women. This finding is consistent with the known relationship between age and PBR mentioned in other studies (Reuben et al., 2009, Butler et al., 2016; Alderman et al., 2003; Morrow et al., 2001; Kruper et al., 2011; Veronesi et al., 2011).

Payer Type, Race, and Socioeconomic Status

This study found that nonwhite women had 35% lower odds of having PBR than white women in Nevada (Table 17), while African American women had lower odds of having PBR compared to women of other races in the United States (Table 11). These results are similar to other studies (Yang et al., 2013; Kwok et al., 2015). Several studies have shown that Asian women are one-third as likely as white women to have PBR (McGuire et al., 2009; Kruper et al., 2011; Kwok et al., 2015). Another study found that Middle Eastern and Hispanic women the same odds for having PBR compared to white women, but African American and Asian women did not (Tseng et al., 2004). Interestingly, Reuben et al. (2009) concluded that race was only a significant predictor of PBR when hospital characteristics were controlled for (Reuben et al., 2009) The interaction between race and hospital location/teaching status was significant in the multiple logistic regression model for the overall United States, but not for all the individual years.

Researchers agree that African American women are disproportionately less likely to have PBR than white women (Alderman et al., 2009; Kruper et al., 2011). African American women are diagnosed with early-stage breast cancer less than other women (Rubin et al., 2013).

Later-stage cancer diagnoses can contribute to their lower PBR rates since mastectomies are recommended for early-stage breast cancer treatment (American Cancer Society, 2015). It should be mentioned that Morrow et al. (2005) concluded that African American women continued to have lower breast reconstruction rates after controlling for several factors, including the stage of breast cancer (Morrow et al., 2005). These authors provide evidence that other factors impact the low PBR rates in African American women. Alderman et al. (2009) found that African American women were less likely to have a consultation with a plastic surgeon than other women (Alderman et al., 2009). In addition, it has been reported that oncologists have shorter visits and have less discussion about their illness with African American patients (Mahmoundi, Lu, Metz, Momoh, & Chung, 2018). In one study, African American women agreed that they had less discussion, than desired, with their physician about the breast reconstruction options and they felt that their physician discouraged them from having PBR (Alderman et al., 2009). These results could partially be due to physician bias (Alderman et al., 2003) or from other reasons due to the patient's health. Furthermore, medical distrust continues to affect the African American population from historical experiments that were unethical. (Rubin et al., 2013; Mahmoundi et al., 2018; Butler, Familusi, Serletti, & Fox, 2018).

Nevada has a diverse population, with more than half of the population identifying as a different race than white. As of 2017, 31.1% of Nevadans speak a different language than English at home (U.S Census Bureau, 2017). Language barriers are contributing to lower PBR rates in women of color. Berlin et al. (2018) discussed that women who primarily speak Spanish seldom have PBR compared with other minority women (Berlin et al.,2018). Moreover, a study found that only 37% of medical graduates speak another language besides English (Mahmoundi et al., 2018). The absence of effective communication between a woman and her doctor could negatively impact her decision on breast reconstruction, if she doesn't fully understand her options (Yang et al., 2013; Shippee et al., 2014). Overall, minorities feel that they receive less counseling on breast reconstruction options and desire more information than provided (Alderman et al., 2009).

SES has a tremendous impact on PBR rates (Mahmoundi et al., 2018). In this study, household income status was only significant in the United States while women with high-income had higher odds of having PBR than the other income categories. The interaction between race and SES, however, was not significant in the multiple logistic regression models for the overall United States and Nevada. It is known that low-income women are less likely to have PBR than other women (Shippee et al., 2014). A few reasons these lower rates, include the amount of time they would have to take off from work, lack of insurance or inadequate insurance coverage, and less access to hospitals that can accommodate PBR procedures (Kruper et al., 2011; Yang et al., 2013; Alderman et al., 2003).

Other studies use payer type information as an indicator for SES since race disparities can be enhanced by unequal access to payer type (Kruper et al., 2011; Shippee et al., 2014). Women of color who had public insurance coverage were less likely to have PBR than white women with the same coverage (Rubin et al., 2013; Tseng et al., 2004; Shippee et al., 2014; Butler et al., 2018). Payer type was an independent predictor of PBR in this study; the results were consistent with other studies. There was a disparity between the categories of payer type and private health insurance. Reimbursement differences among payer types are one contributing factor to racial/ethnic disparities. Private insurance has higher reimbursement rates for PBR and has lower out of pocket expenses for patients than other payer types. Therefore, plastic surgeons limit how many patients they have on public health insurance due to the lower reimbursement rates

(Bauder et al., 2017; Shippee et al., 2014; Kruper et al., 2011). Financial concerns and lack of private health insurance may be a factor in why women of color have lower rates of plastic surgeon consultations (Alderman et al., 2009). As demonstrated, racial/ethnic disparities of PBR have influences from various independent predictors, making it difficult to understand and address thoroughly.

Physician-Patient Discussions and Patient Preferences

According to the literature, two factors have considerable influence on women's breast reconstruction decision, discussions with physicians and the woman's personal preference. Greenberg et al. (2008) concluded that the primary predictor for a woman to have PBR was a documented discussion on the various options between the woman and her physician in their study (Greenberg et al., 2008; Mahmoundi et al., 2017). As mentioned in the previous section, this discussion does not happen for every woman. Physicians' knowledge about breast PBR options directly affects these discussions. A study based in Wisconsin reported that 40% of the general surgeons surveyed did not refer all their patients for breast reconstruction (Stacey et al., 2008). Some of the reasons for not referring breast reconstruction to patients included concerns about cancer reoccurrence and patient's age. A patient's age alone should not deter physicians from discussing breast reconstruction options with patients (Reuben et al., 2009; Greenberg et al., 2008). Also, in the background section of this study, it was discussed that breast reconstruction does not hinder detecting cancer reoccurrences. Wanzel et al. (2002) found that 90% of the plastic surgeons surveyed believed that not all women who were qualified for breast reconstruction were being referred to them because of a lack of physician knowledge on this topic. In addition, the authors confirmed that lack of correct knowledge is a common reason why women do not have breast reconstruction (Wanzel, Brown, Anastakis, & Regehr, 2002). Not all studies believe this statement though. Some studies found that women who had high knowledge of breast reconstruction options still did not have breast reconstruction (Rubin et al., 2013; Morrow et al., 2005).

Patient preferences are significant contributing factors in the decision-making process on PBR. These preferences can be more influential than a physician's advice or opinion (Morrow et al., 2005). One subpopulation where this statement may not be true is with older women. It is found that physicians opinion of breast reconstruction may impact an older woman's decision more than it would their younger counterpart (Morrow et al., 2001). A reason could be that older women are more passive about breast reconstruction decisions and give their physician's advice more power than younger women would (Alderman et al. 2003; Veronsi et al., 2011). On the other hand, older women may be passive about not learning more breast reconstruction because they don't want to have additional surgery, which is a personal preference (Alderman et al., 2003).

Policy

The WHCRA did not reduce the racial/ethnic disparities associated with PBR (Rubin et al., 2013; Shippee et al., 2014; Kruper et al., 2011; Yang et al., 2013). In fact, researchers suggest that the WHCRA caused these disparities to widen even more (Mahmoundi et al., 2017). The reason is that the WHCRA did not introduce any regulations that controlled the differences between private and public insurance reimbursement rates (Butler et al., 2018; Rubin et al., 2013). The disparities that form when payer types have different reimbursement rates for procedures has been discussed, but the group that is usually most impacted are minority women causing the disparity to grow (Shippee et al., 2014).

Since the WHCRA, several pieces of legislation have been introduced to try and decrease the racial/ethnic disparities in healthcare and increase knowledge of breast reconstruction options. The first piece of legislation is the Patient Protection and Affordable Care Act of 2010 (ACA). The ACA is a healthcare reform law that provides subsidies to lower the cost of health insurance, which in turn, increases the access to healthcare. It mandated that all individuals need to have health insurance and insurance companies cannot deny access to people with preexisting conditions or people with a history of cancer care (Davis, Abrams, & Kristof, 2011). The ACA was enacted on March 23rd, 2010, and it took until January 1st, 2014 for most of the healthcare changes to happen (eHealth, 2018). One provision of the ACA was a Medicaid expansion program. States were allowed to choose whether or not they wanted to participate in it. This expansion would allow individuals to qualify for Medicaid if their income was under 138% of the federal poverty level. As of 2017, 31 states and Washington D.C choose to participate in the Medicaid expansion. In 2014, Nevada agreed to the Medicaid expansion (McGinley & Goldstein, 2017). In this study, there was an increase in Medicaid and Medicare coverage when comparing 2008 to 2013 for both Nevada and the United States (Table 18). Research shows that the ACA did reduce the overall racial/ethnic disparity in healthcare access (Chen, Vargas-Bustamanate, Mortensen, & Oretga, 2016; Davis et al., 2011; Shippee et al., 2014).

Table 18. Percent of Women Covered by Insurance in 2008 and 2013 for United States and Nevada

Year	Private Insurance	Medicaid	Medicare	Other
United States				
2008	42.2%	9.9%	43.2%	2.6%
2013	37.8%	12.5%	45.5%	2.1%
Nevada				
2008	45.9%	6.8%	39.9%	4.3%
2013	36.7%	9.4%	47.1%	2.4%

The next piece of legislation is the New York Public Health (NY PBH) Law 2803-O (2011). This law was enacted on January 1st, 2011. It mandates that general hospitals must provide specific information to every patient having breast cancer treatment surgery. They must offer inpatient care after the surgery to every patient, as well as, provide information on the breast reconstruction options to every patient. This information needs to include; advantages and disadvantages of breast reconstruction procedures, how to access breast reconstruction care if that hospital does not offer it and how to acquire breast reconstruction after other treatments are finished, and the commissioner may require additional information as well. All information must be provided in written form, so that patients can refer to it later (NY PBH 2803-O, 2011). Mahmoundi et al. (2017) analyzed the effect of this law on breast reconstruction in New York during 2008-2011. The study resulted in three main findings; this law did not increase the overall PBR rate, it did not decrease the disparity between African American women and white women, but this law did decrease the disparity between Hispanic and white women, as well as, reducing the disparity between white women and other minorities (Mahmoundi et al., 2017).

The last piece of legislation that was introduced after the WHCRA to increase knowledge of breast reconstruction options is the Breast Cancer Patient Education Act of 2015. Two bills were introduced in the 114th U.S. legislative session, Senate Bill 1192 (2015) and House of Representative Bill 2540. Both these bills aimed to amend the Public Service Act to require the Department of Health and Human Services to plan and implement a breast reconstruction education campaign targeted towards women of color breast cancer patients (S.1192, 2015; H.R.2540, 2015). On December 18th, 2015, Congress enacted the Breast Cancer Patient Education Act (American Society of Plastic Surgeons, 2015). Overall, there is a national and state level effort to implement policies that will decrease the racial/ethnic disparities in healthcare and increase knowledge of breast reconstruction options.

Limitations

There were several limitations of this study. In secondary analyses, researchers do not decide what information is collected nor do they collect the data themselves. The NIS and SID databases use discharge records from various hospitals. It is possible that errors could have occurred when recording patient information, diagnosis and procedure codes, and hospital information. With discharge records in HCUP databases, it is difficult to determine if the same patient had multiple discharge records since they are not linked to patients. In addition, there was specific hospital characteristic information collected in the NIS database that was not available in the SID database. Due to this lack of information, this study was not able to determine the relationship between hospital location and teaching status and PBR rates in Nevada.

Another limitation of this study was the use of inpatient discharge records. In this study, the PBR rates produced are representative of PBR surgeries performed in an inpatient setting, but not of all the PBR surgeries in the United States and Nevada. Since trends show an increase in outpatient breast cancer treatment surgeries, this is a significant limitation. Also, the use of these discharge records didn’t allow this study to determine DBR rates for the United States and Nevada. The discharge records used only account for past and current procedures, meaning it cannot be determined if patients had DBR in the future.

Future Public Health Policy and Research Recommendations

This study illustrates the continuation of disparities among age, payer types, race/ethnicities, and SES in PBR seen in previous years in the United States. The implementation of several policies has occurred in the last twenty years to try and decrease these disparities.

Further analysis of how effective policy efforts are on increasing minorities' breast reconstruction rates at a state level is needed. Evidence has been provided by Mahmoundi et al. (2017) that shows the impact mandated education for breast cancer patients had on racial/ethnic disparities of PBR in New York (Mahmoundi et al., 2017). In addition to research, policy makers should ensure that federally mandated education is available in multiple languages, as well as, representative of all of cultures. Lastly, the American Society of Plastic Surgeons and policy makers should develop programs that will increase access to breast reconstruction in rural areas.

Multiple studies, including this one, have provided evidence to show that quantitative research alone cannot explain the differences in the breast reconstruction decision-making process among women. Discussions about breast reconstruction options and patient preferences are two factors that influence this decision-making process. More qualitative and mixed-methods research on these factors are needed to explain the variation in PBR rates among women in the United States and Nevada. Furthermore, additional research on outpatient breast reconstruction procedures and DBR is needed to gain a better understanding of the overall breast reconstruction rates in the United States and Nevada.

To the author's knowledge, no published studies have analyzed state-specific data on PBR in Nevada. This study provided information on the variation that occurs among women who have PBR and who do not. The data used in this study was not the most recent data available. Additional research with more recent data on PBR is needed to understand the disparities of PBR in Nevada better.

Conclusion

The purpose of this study was to determine factors that are associated with women choosing whether or not to have PBR in the United States with more recent data. Additionally, this study aimed to provide insight into the specific groups of women who do or do not choose to have PBR in Nevada. Women who are younger, white, have private insurance, and seek care at an urban teaching hospital continue to be more likely to have PBR than other women. Despite the efforts of the WHCRA, disparities among age, payer types, racial/ethnic groups, and socioeconomic statuses in PBR still exist in the United States and Nevada. Research discussed in this study provides evidence that the breast reconstruction decision-making process is complex and relies heavily on patient's knowledge of breast reconstruction options, patient-physician based discussions, and patient preferences. Nevada should use New York as an example and implement policies that mandate education on breast reconstruction options for all patients receiving breast cancer treatment surgery. In addition, plastic surgeons and policy makers should develop programs that will increase access to breast reconstruction in rural areas.

Appendices

Appendix A: Tables

Table 8. Demographic Frequencies for Individual Years in the United States

Variable	2008 Reconstruction n(%)	2008 No reconstruction n(%)	2009 Reconstruction n(%)	2009 No reconstruction n(%)	2010 Reconstruction n(%)	2010 No reconstruction n(%)
Age						
18-29 years old	327(1.4)	1029(0.6)	414(1.4)	938(0.5)	447(1.4)	1,184(0.7)
30-39 years old	2,415(10.4)	8,139(4.5)	2,941(10.1)	7,124(4.1)	3,290(10.4)	6,874(4.0)
40-49 years old	7,831(33.8)	27,149(14.9)	9,794(33.5)	24,003(13.7)	10,606(33.6)	24,714(14.2)
50-59 years old	7,261(31.4)	40,132(22)	9,300(31.8)	38,214(21.8)	10,076(31.9)	38,429(22.1)
60-69 years old	4,118(17.8)	43,738(23.9)	5,503(18.8)	43,388(24.8)	5,675(18)	43,872(25.2)
70-79 years old	1,125(4.9)	36,509(20)	1,140(3.9)	36,264(20.7)	1,360(4.3)	34,983(20.1)
80-90 years old	78(0.3)	26,009(14.2)	110(0.4)	25,332(14.5)	139(0.4)	23,758(13.7)
Race						
White	15,118(79.5)	107,069(72.7)	19,469(76.1)	104,770(69.6)	22,70(77.3)	106,406(68.6)
African American	1,475(7.8)	20,703(14.1)	2,237(8.7)	23,557(15.6)	2,929(10)	27,723(17.9)
Hispanic	1,094(5.8)	11,088(7.5)	1,957(7.7)	12,531(8.3)	2,141(7.3)	13,036(8.4)
Asian/Pacific	698(3.7)	4,251(2.9)	899(3.5)	4,170(2.8)	814(2.8)	3,673(2.4)
Native American	49(0.3)	553(0.4)	222(0.9)	749(0.5)	56(0.2)	685(0.4)
Other	583(3.1)	3,592(2.4)	794(3.1)	4,769(3.2)	732(2.5)	3,672(2.4)
Payer type						
Private Insurance	18,384(79.5)	68,339(37.4)	22,892(78.5)	59,796(34.2)	24,452(77.5)	59,284(34.2)
Self-pay	247(1.1)	3,047(1.7)	327(1.1)	3,906(2.2)	238(0.8)	3,623(2.1)
Medicaid	1,074(4.6)	19,244(10.5)	1,707(5.9)	21,590(12.3)	2,281(7.2)	24,383(14.1)
Medicare	2,928(12.7)	85,937(47.1)	3,355(11.5)	85,760(49)	3,920(12.4)	81,943(47.2)
No charge	54(0.2)	1,112(0.6)	50(0.2)	556(0.3)	66(0.2)	915(0.5)
Other	437(1.9)	4,828(2.6)	833(2.9)	3423(2.0)	610(1.9)	3,314(1.9)
Household income status						
Low income	2,722(12)	46,387(25.8)	3,726(13.1)	46,406(27.3)	4,296(13.9)	47,655(28.1)
Low/middle income	4,379(19.3)	47,559(26.5)	5,103(17.9)	44,793(26.4)	5,522(17.9)	40,966(24.2)
High/middle income	5,686(25)	42,209(23.5)	7,273(25.6)	39,598(23.3)	7,719(25)	41,564(24.5)
High income	9,936(43.7)	43,341(24.1)	12,347(43.4)	39,191(23.1)	13,372(43.3)	39,374(23.2)
Hospital location/teaching status						
Rural	443(1.9)	21,804(12)	702(2.5)	21,034(12.2)	680(2.2)	20,509(11.9)
Urban nonteaching	7,616(32.9)	73,644(40.4)	9834(34.4)	73,067(42.5)	9,568(30.7)	68,217(39.6)
Urban teaching	15,089(65.2)	87,003(47.7)	18,025(63.1)	77,704(45.2)	20,933(67.1)	83,417(48.5)

Table 8 cont. Demographic Frequencies for Individual Years in the United States

Variable	2011 Reconstruction n(%)	2011 No reconstruction n(%)	2012 Reconstruction n(%)	2012 No reconstruction n(%)	2013 Reconstruction n(%)	2013 No reconstruction n(%)
Age						
18-29 years old	444(1.3)	981(0.5)	385(1.2)	795(0.5)	375(1.2)	820(0.5)
30-39 years old	3,141(9.3)	7,252(4.0)	3370(10.5)	6,805(4.1)	3,000(10.0)	6,060(3.8)
40-49 years old	11,087(32.9)	23,637(13.1)	10,310(32.1)	20,815(12.6)	9,290(30.8)	19,395(12.2)
50-59 years old	10,661(31.6)	38,657(21.5)	10,255(31.9)	35,810(21.6)	9,860(32.7)	34,950(22.0)
60-69 years old	6,782(20.1)	47,101(26.2)	6,235(19.7)	43,255(26.1)	6,020(20.0)	41,495(26.1)
70-79 years old	1,481(4.4)	37,045(20.6)	1,395(4.3)	32,860(19.9)	1,480(4.9)	32,605(20.5)
80-90 years old	118(0.3)	25,443(14.1)	110(0.3)	25,180(15.2)	90(0.3)	23,550(14.8)
Race						
White	23,716(75.4)	113,167(68.5)	22,475(73.2)	107,960(68.8)	20,725(72.6)	103,045(68.3)
African American	3,253(10.3)	29,549(17.9)	3,275(10.7)	25,660(16.3)	3,095(10.8)	25,850(17.1)
Hispanic	2,482(7.9)	13,571(8.2)	2,185(7.1)	12,880(8.2)	2,340(8.4)	12,705(8.4)
Asian/Pacific	994(3.2)	4,157(2.5)	970(3.2)	4,485(2.9)	1,255(4.4)	4,710(3.1)
Native American	56(0.2)	665(0.4)	105(0.3)	885(0.6)	65(0.2)	665(0.4)
Other	962(3.1)	4,044(2.4)	1,675(5.5)	5,130(3.3)	1,010(3.5)	3,830(2.5)
Payer type						
Private Insurance	25,845(76.7)	60,134(33.5)	24,140(75.2)	52,675(31.9)	22,205(73.8)	49,070(30.9)
Self-pay	221(0.7)	2,902(1.6)	390(1.2)	3,235(2.0)	265(0.9)	3,155(2.0)
Medicaid	2,230(6.6)	22,408(12.5)	2,655(8.3)	21,225(12.8)	2,725(9.1)	20,785(13.1)
Medicare	4,538(13.5)	89,671(49.9)	4,185(13.0)	84,160(50.9)	3,950(13.1)	81,955(51.7)
No charge	57(0.2)	479(0.3)	55(0.2)	420(0.3)	65(0.2)	535(0.3)
Other	793(2.4)	4,097(2.3)	680(2.1)	3,505(2.1)	885(2.9)	3,160(2.0)
Household income status						
Low income	4,586(13.8)	48,110(27.2)	4,490(14.2)	44,875(27.7)	4,025(13.6)	41,085(26.4)
Low/middle income	5,780(17.4)	41,890(23.7)	5,680(18.0)	38,730(23.9)	5,595(18.9)	40,340(26.0)
High/middle income	9,081(27.4)	46,065(26.0)	8,545(27.0)	39,390(24.3)	7,920(26.8)	38,775(24.9)
High income	13,690(41.3)	40,955(23.1)	12,900(40.8)	39,090(24.1)	12,060(40.7)	35,215(22.7)
Hospital location/teaching status						
Rural	584(1.7)	20,246(11.4)	635(2.0)	17,520(10.6)	550(1.8)	16,920(10.6)
Urban nonteaching	11,506(34.4)	70,466(39.5)	9360(29.1)	61,205(37.0)	8,740(29.0)	57,220(36.0)
Urban teaching	21,402(63.9)	87,464(49.1)	22,155(68.9)	86,795(52.4)	20,825(69.2)	84,735(53.3)

Table 9. Complex Samples Logistic Regression Models for Independent Variables in the United States

Variable (reference group)	2008 OR	2008 C.I	2008 P-value	2009 OR	2009 C.I	2009 P-value	2010 OR	2010 C.I	2010 P-value
Age (40-49 years old)			**<0.001**			**<0.001**			**<0.001**
18-29 years old	0.91	0.69-1.20		0.92	0.71-1.20		1.14	0.89-1.46	
30-39 years old	0.97	0.87-1.09		0.99	0.89-1.10		0.90	0.81-1.00	
50-59 years old	1.60	1.47-1.72		1.68	1.56-1.80		1.64	1.52-1.76	
60-69 years old	3.07	2.80-3.36		3.22	2.96-3.49		3.32	3.06-3.60	
70-79 years old	9.37	8.12-10.80		13.0	11.2-15.0		11.0	9.68-12.6	
80-90 years old	96.3	58.7-158		93.7	61.8-142		73.6	50.2-108	
Race (African American)			**<0.001**			**<0.001**			**<0.001**
White	0.51	0.45-0.57		0.51	0.46-0.57		0.50	0.45-0.54	
Hispanic	0.72	0.60-0.86		0.61	0.53-0.70		0.64	0.56-0.74	
Asian/Pacific	0.43	0.35-0.54		0.44	0.37-0.53		0.48	0.39-0.58	
Native American	0.80	0.41-1.55		0.32	0.22-0.46		1.29	0.69-2.41	
Other	0.44	0.35-0.55		0.57	0.47-0.69		0.53	0.44-0.65	
Payer type (private insurance)			**<0.001**			**<0.001**			**<0.001**
Self-pay	3.32	2.48-4.44		1.57	1.32-1.88		6.27	4.66-8.42	
Medicaid	4.82	4.19-5.54		4.23	2.05-8.72		4.41	3.98-4.88	
Medicare	7.89	7.22-8.63		9.79	8.99-10.7		8.62	7.96-9.34	
No charge	5.57	3.04-10.2		4.84	4.31-5.44		5.72	3.25-10.1	
Other	2.97	2.39-3.69		4.57	3.53-5.92		2.24	1.84-2.73	
Household income status (high income)			**<0.001**			**<0.001**			**<0.001**
Low income	3.91	3.54-4.31		3.92	3.59-4.28		3.77	3.47-4.09	
Low/middle income	2.49	2.29-2.71		2.77	2.56-2.99		2.52	2.33-2.72	
High/middle income	1.70	1.57-1.84		1.72	1.60-1.84		1.83	1.70-1.96	
Hospital location/teaching status (urban/teaching)			**<0.001**			**<0.001**			**<0.001**
Rural	8.53	6.87-10.6		6.95	5.86-8.25		7.57	6.42-8.93	
Urban nonteaching	1.68	1.57-1.79		1.72	1.62-1.83		1.79	1.69-1.90	

Table 9 cont. Complex Samples Logistic Regression Models for Independent Variables in the United States

Variable (reference group)	2011 OR	2011 C.I	2011 P-value	2012 OR	2012 C.I	2012 P-value	2013 OR	2013 C.I	2013 P-value	Overall NIS database OR	Overall NIS database C.I	Overall NIS database P-value
Age (40-49 years old)			**<0.001**			**<0.001**			**<0.001**			**<0.001**
18-29 years old	1.04	0.81-1.33		1.02	0.78-1.35		1.05	0.79-1.38		1.01	0.91-1.13	
30-39 years old	1.08	0.98-1.20		1.00	0.90-1.11		0.97	0.87-1.08		0.98	0.94-1.03	
50-59 years old	1.70	1.59-1.82		1.73	1.61-1.86		1.70	1.58-1.83		1.66	1.61-1.71	
60-69 years old	3.26	3.02-3.51		3.39	3.13-3.67		3.30	3.04-3.58		3.22	3.12-3.33	
70-79 years old	11.7	10.4-13.3		11.7	10.2-13.3		10.6	9.28-12.0		11.1	10.5-11.7	
80-90 years old	101	67.9-151		113	74.3-173		125	78.6-200		97.7	82.1-116	
Race (African American)			**<0.001**			**<0.001**			**<0.001**			**<0.001**
White	0.53	0.48-0.57		0.61	0.56-0.67		0.60	0.54-0.65		0.55	0.53-0.57	
Hispanic	0.60	0.53-0.68		0.75	0.66-0.86		0.63	0.56-0.72		0.66	0.62-0.70	
Asian/Pacific	0.46	0.39-0.55		0.59	0.50-0.70		0.45	0.38-0.53		0.48	0.45-0.52	
Native American	1.30	0.71-2.37		1.08	0.68-1.70		1.23	0.69-2.18		0.81	0.66-0.99	
Other	0.46	0.39-0.55		0.39	0.34-0.45		0.45	0.38-0.54		0.46	0.43-0.50	
Payer type (private insurance)			**<0.001**			**<0.001**			**<0.001**			**<0.001**
Self-pay	5.63	4.17-7.60		3.80	3.00-4.82		5.39	4.06-7.15		4.65	4.15-5.19	
Medicaid	4.32	3.90-4.78		3.66	3.33-4.04		3.45	3.14-3.80		4.04	3.87-4.22	
Medicare	8.49	7.90-9.13		9.22	8.53-9.96		9.39	8.67-10.2		8.79	8.51-9.08	
No charge	3.62	1.98-6.59		3.50	1.87-6.57		3.73	2.09-6.63		4.57	3.56-5.87	
Other	2.22	1.88-2.63		2.36	1.96-2.85		1.62	1.36-1.92		2.08	1.93-2.24	
Household income status (high income)			**<0.001**			**<0.001**			**<0.001**			**<0.001**
Low income	3.51	3.24-3.80		3.30	3.04-3.58		3.50	3.21-3.81		3.61	3.48-3.74	
Low/middle income	2.42	2.25-2.61		2.25	2.08-2.43		2.47	2.29-2.67		2.49	2.41-2.57	
High/middle income	1.70	1.59-1.81		1.52	1.42-1.63		1.68	1.56-1.80		1.68	1.63-1.73	
Hospital location/teaching status (urban/teaching)			**<0.001**			**<0.001**			**<0.001**			**<0.001**
Rural	8.48	1.01-10.3		7.04	5.88-8.43		7.56	6.23-9.17		7.67	7.11-8.27	
Urban nonteaching	1.50	1.42-1.58		1.67	1.57-1.77		1.61	1.51-1.74		1.67	1.63-1.71	

Table 10. Complex Samples Multiple Logistic Regression for Individual Years in the United States

	2008			2009			2010		
Variable (reference group)	**OR**	**C.I**	**P-value**	**OR**	**C.I**	**P-value**	**OR**	**C.I**	**P-value**
Age (40-49 years old)			**<0.001**			**<0.001**			**<0.001**
18-29 years old	0.73	0.53-1.01		0.87	0.62-1.22		1.16	0.85-1.57	
30-39 years old	0.98	0.85-1.12		1.02	0.90-1.17		1.01	0.89-1.14	
50-59 years old	1.27	1.15-1.40		1.35	1.23-1.48		1.36	1.24-1.48	
60-69 years old	1.68	1.50-1.89		1.72	1.55-1.91		1.94	1.76-2.15	
70-79 years old	3.28	2.70-3.97		4.61	3.85-5.51		4.23	3.59-4.99	
80-90 years old	31.8	18.0-55.8		26.6	17.15-41.1		27.1	17.6-41.5	
Race (African American)			**<0.001**			**<0.001**			**<0.001**
White	0.69	0.52-0.93		0.45	0.33-0.60		0.48	0.38-0.62	
Hispanic	0.91	0.60-1.37		0.39	0.26-0.57		0.67	0.49-0.94	
Asian/Pacific	1.03	0.68-1.55		0.55	0.37-0.82		1.02	0.69-1.51	
Native American	0.36	0.094-1.39		0.27	0.10-0.74		N/A	N/A	
Other	1.14	0.70-1.88		0.52	0.33-0.82		0.59	0.38-0.93	
Payer type (private insurance)			**<0.001**			**<0.001**			**<0.001**
Self-pay	2.70	1.90-3.82		4.70	3.38-6.53		1.80	1.43-2.27	
Medicaid	3.2	2.71-3.78		3.9	3.38-4.51		6.43	3.53-11.7	
Medicare	1.83	1.61-2.08		2.18	1.94-2.45		1.88	1.69-2.09	
No charge	6.53	3.25-13.1		3.51	1.60-7.72		3.71	3.26-4.21	
Other	2.16	1.66-2.82		1.37	1.10-1.71		5.38	3.84-7.54	
Household income status (high income)			**<0.001**			**<0.001**			**<0.001**
Low income	2.33	1.64-3.30		1.40	1.01-1.95		1.75	1.33-2.31	
Low/middle income	1.83	1.26-2.66		1.20	0.84-1.72		1.40	1.02-1.92	
High/middle income	1.45	1.00-2.12		0.72	0.51-1.01		1.33	0.99-1.80	
Hospital location/teaching status (urban/teaching)			**<0.001**			**<0.001**			**<0.001**
Rural	3.02	1.18-7.70		7.56	1.78-32.15		12.1	3.79-38.4	
Urban nonteaching	1.28	0.96-1.69		1.41	1.11-1.81		1.25	0.99-1.57	

Table 10 cont. Complex Samples Multiple Logistic Regression for Individual Years in the United States

	2011			2012			2013		
Variable (reference group)	**OR**	**C.I**	**P-value**	**OR**	**C.I**	**P-value**	**OR**	**C.I**	**P-value**
Age (40-49 years old)			**<0.001**			**<0.001**			**<0.001**
18-29 years old	1.08	0.81-1.45		1.00	0.73-1.37		1.21	0.88-1.66	
30-39 years old	1.18	1.05-1.34		1.12	0.99-1.27		1.11	0.97-1.26	
50-59 years old	1.35	1.25-1.47		1.40	1.29-1.53		1.32	1.21-1.45	
60-69 years old	1.83	1.66-2.01		1.81	1.64-2.00		1.68	1.52-1.87	
70-79 years old	4.62	3.95-5.42		4.05	3.44-4.77		3.00	2.55-3.55	
80-90 years old	38.7	24.7-60.7		31.9	20.5-49.7		34.6	20.9-57.2	
Race (African American)			**0.02**			**<0.001**			**<0.001**
White	0.78	0.63-0.96		0.55	0.43-0.70		0.83	0.65-1.05	
Hispanic	0.93	0.68-1.28		0.73	0.52-1.04		1.04	0.74-1.47	
Asian/Pacific	1.1	0.77-1.57		1.38	0.97-1.98		1.36	0.97-1.89	
Native American	1.4	0.30-6.46		1.64	0.58-4.61		6.84	0.83-56.1	
Other	0.75	0.51-1.11		0.52	0.37-0.73		0.91	0.62-1.34	
Payer type (private insurance)			**<0.001**			**<0.001**			
Self-pay	7.54	5.08-11.2		3.61	2.77-4.71		4.59	3.37-6.24	
Medicaid	3.01	2.67-3.38		2.81	2.52-3.14		2.56	2.29-2.87	
Medicare	1.83	1.65-2.02		2.04	1.84-2.26		2.19	1.97-2.44	
No charge	2.93	1.53-5.64		3.27	1.71-6.24		3.63	1.97-6.68	
Other	1.67	1.37-2.04		1.82	1.47-2.24		1.37	1.11-1.69	
Household income status (high income)			**<0.001**			**0.10**			**<0.001**
Low income	2.39	1.86-3.08		1.38	1.05-1.82		1.91	1.46-2.51	
Low/middle income	1.47	1.12-1.95		1.27	0.94-1.71		1.75	1.30-2.35	
High/middle income	1.38	1.06-1.79		0.94	0.70-1.26		1.48	1.10-1.99	
Hospital location/teaching status (urban/teaching)			**<0.001**			**<0.001**			**<0.001**
Rural	10.22	3.12-33.53		7.85	2.55-24.2		27.7	4.13-186	
Urban nonteaching	1.52	1.24-1.87		1.29	1.04-1.59		1.65	1.31-2.07	

Table 16. Individual Independent Variables Logistic Regression for Nevada

Variable (reference group)	OR	C.I	P-value
Age (41-64 years old)			**<0.001**
18-40 years old	0.47	0.37-0.60	
65-90 years old	3.30	2.70-4.03	
Race (nonwhite)			**<0.001**
White	1.45	1.20-1.75	
Payer type (private insurance)			**<0.001**
Self-pay	6.49	3.05-13.9	
Medicaid	4.98	3.27-7.58	
Medicare	5.13	4.18-6.29	
Other	2.65	1.56-4.52	
Household income status (high income)			**<0.001**
Low income	2.14	1.62-2.84	
Low/middle income	1.54	1.23-1.92	
High/middle income	1.13	0.94-1.36	

Appendix B: Healthcare Cost and Utilization Project Certification

7/2/18, 5:18 PM

Appendix C: Internal Review Board Exclusion

From: **Cindy Lee-Tataseo** <no-reply@irbnet.org>
Date: Tue, Nov 6, 2018 at 11:39 AM
Subject: IRBNet Board Action
To: Nirav Patel <nirav.patel@unlv.edu>, Richard Baynosa <richard.baynosa@unlv.edu>, Shelley Williams <shelleyj.williams@unlv.edu>

Please note that UNLV School of Medicine IRB has taken the following action on IRBNet:

Project Title: [1283141-1] Trends in Post-Mastectomy Breast Reconstruction Utilization using HCUP Databases
Principal Investigator: Richard Baynosa, M.D.

Submission Type: New Project
Date Submitted: October 16, 2018

Action: RESEARCH - NOT HSR
Effective Date: November 6, 2018
Review Type: Administrative Review

Should you have any questions you may contact Cindy Lee-Tataseo at cindy.lee-tataseo@unlv.edu.

Thank you,
The IRBNet Support Team

www.irbnet.org

References

Alderman, A., Wei, Y, & Birkmeyer, J. (2006). Use of breast reconstruction after mastectomy following the Women's Health and Cancer Rights Act [abstract]. *JAMA, 295*(4), 383-388. DOI:10.1001/jama.295.4.387

Al-Ghazal, S., Sully, L., Fallowfield, L., & Blamey, R. (2000). The psychological impact of immediate rather than delayed breast reconstruction. *European Journal of Surgical Oncology, 26*(1), 17-19. DOI: 10.1053/ejso.1999.0733

Alderman, A., McMahon, L., & Wilkins, E. (2003). The national utilization of immediate and early delayed breast reconstruction and the effect of sociodemographic factors. *Plastic and Reconstructive Surgery, 111*(2), 695-703.
DOI: 10.1097/01.PRS.0000041438.50018.02

Alderman, A., Hawley, S, Janz, N., Mujahid, M., Morrow, M., Hamilton, A., Graff, J., & Katz, S. (2009). Racial and ethnic disparities in the use of postmastectomy breast reconstruction: Results from a population-based study. *Journal of Clinical Oncology, 27*(32), 5325- 5330. DOI:10.1200/JCO.2009.22.2455

American Cancer Society. (2016). Breast cancer facts & figures 2015-2016. Retrieved from https://www.cancer.org/content/dam/cancer-org/research/cancer-facts-and-statistics/breast-cancer-facts-and-figures/breast-cancer-facts-and-figures-2015-2016.pdf

American Society of Plastic Surgeons [ASPS]). (2015). ASPS secures passage of the Breast Cancer Patient Education Act. Retrieved from https://www.plasticsurgery.org/news/press-releases/asps-secures-passage-of-the-breast-cancer-patient-education-act

Atisha D., Alderman A., Lowery J., Kuhn, L., Davis, J, & Wilkins, G. (2008). Prospective analysis of long-term psychosocial outcomes in breast reconstruction: Two-year postoperative results from the Michigan Breast Reconstruction Outcomes Study. *Ann Surg, 247*(6), 1019-28. DOI:10.1097/SLA.0b013e3181728a5c

Barnsley, G., Sigurdson, L., & Kirkland, S. (2008). Barriers to breast reconstruction after mastectomy in Nova Scotia. *Canadian Journal of Surgery, 51*(6), 447.

Bauder, A., Gross, C., Killelea, B., Butler, P., Kovach, S., & Fox, J. (2017). The relationship between geographic access to plastic surgeons and breast reconstruction rates among women undergoing mastectomy for cancer. *Annals of Plastic Surgery, 78*(3), 324-329. DOI: 10.1097/SAP.0000000000000849

Benefits.gov. (n.d). Health care benefits for dependents (CHAMPVA). Retrieved from https://www.benefits.gov/benefit/318

Berlin, N., Wilkins, E., & alderman, A. (2018). Addressing continued disparities in access to breast reconstruction on the 20th anniversary of the Women's Health and Cancer Rights Act. *JAMA Surgery, 153*(7), 603-604. DOI: http://dx.doi.org/10.1001/jamasurg.2018.0387

Boehmler, J. & Butler, C. (2010). Chapter five: Latissimus dorsi flap breast reconstruction. E. J. Hall-Findlay & G. Evans (Eds.), *Aesthetic and Reconstructive Surgery of the Breast* (pp. 51-60). Saunders/Elsevier.

Butler, P., Nelson, J., Fischer, J., Wink, J., Chang, B., Fosnot, J.,…Serletti, J. (2016). Racial and age disparities persist in immediate breast reconstruction: an updated analysis of 48,564 patients from the 2005 to 2011 American College of Surgeons National Surgery Quality

Improvement Program data sets. *The American Journal of Surgery, 212*, 96-101. DOI: http://dx.doi.org/10.1016/j.amjsurg.2015.08.025

Butler, P., Familusi, O., Serletti, J., & Fox, J. (2018). Influence of race, insurance status, and geographic access to plastic surgeons on immediate breast reconstruction rates. *American Journal of Surgery, 215*(6), 987-994. https://doi.org/10.1016/j.amjsurg.2017.09.037

Chen, J., Vargas-Bustamante, A., Mortensen, K., & Ortega, A. (2016). Racial and ethnic disparities in health care access and utilization under the Affordable Care Act. *Med Care, 54*(2), 140-146. DOI: 10.1097/MLR.0000000000000467

Cheng, M. & Huang, J. (2010). Chapter eleven: Gluteal flap breast reconstruction. E. J. Hall-Findlay & G. Evans (Eds.), *Aesthetic and Reconstructive Surgery of the Breast* (pp. 161-170). Saunders/Elsevier.

Davis, K., Abrams, M., & Kristof, S. (2011). How the Affordable Care Act will strengthen the nation's primary care foundation. *Journal of General Internal Medicine, 26*(10), 1201–1203.

eHealth. (2018). History and timeline of the Affordable Care Act (ACA). Retrieved from https://www.ehealthinsurance.com/resources/affordable-care-act/history-timeline-affordable-care-act-aca

Griswold, T., Gunawan, A., & Packham, J. (2018). Physician workforce in Nevada 2018 edition. Retrieved from https://med.unr.edu/statewide/reports

Greenberg, C., Schneider, E., Lipsitz, S., Ko, C., Malin, J., Epstein, A.,…Kahn, K. (2007). Do variations in provider discussions explain socioeconomic disparities in postmastectomy breast reconstruction?. *Journal of the American College of Surgeons, 206*(4), 605-615. DOI: 10.1016/j.jamcollsurg.2007.11.017

Healthcare Cost and Utilization Project (HCUP). (October, 2015). Producing national HCUP estimates. Retrieved from https://www.hcup-us.ahrq.gov/tech_assist/nationalestimates/508_course/508course.jsp#weighting

Healthcare Cost and Utilization Project (HCUP). (January, 2018[a]). HCUP overview. Retrieved from https://www.hcup-us.ahrq.gov/overview.jsp

Healthcare Cost and Utilization Project (HCUP). (May, 2018[b]). National (Nationwide) Inpatient Sample (NIS). Retrieved from www.hcupus.ahrq.gov/news/exhibit_booth/nis_brochure.jsp.

Healthcare Cost and Utilization Project (HCUP). (July, 2018[c]). HCUP frequently asked questions. Retrieved from https://www.hcup-us.ahrq.gov/tech_assist/faq.jsp

Healthcare Cost and Utilization Project (HCUP). (August, 2018[d]). NIS description of data elements. Retrieved from https://www.hcup-us.ahrq.gov/db/nation/nis/nisdde.jsp

Heath Resources & Services Administration (HRSA). (January, 2019). Title V maternal and child health services block grant program. Retrieved from https://mchb.hrsa.gov/maternal-child-health-initiatives/title-v-maternal-and-child-health-services-block-grant-program

Hospital care for mastectomy, lumpectomy, and lymph node dissection patients, NY PBH 2803-O. (2011).

Hwang, S., Lichtensztajn, D., Gomez, S., Fowble, B., & Clarke, C. (2013). Survival after lumpectomy and mastectomy for early stage invasive breast cancer. *Cancer, 119*(7), 1402-11. https://doi.org/10.1002/cncr.27795

Kruper, L., Holt, A., Xu, X., Duan, L., Henderson, K., Bernstein, L., & Ellenborn, J. (2011).

Disparities in reconstruction rates after mastectomy: Patterns of care and factors associated with the use of breast reconstruction in southern California. *Ann Surg Oncol, 18*, 2158-2165. DOI:10.1245/s10434-011-1580-z

Kwok, A., Goodwin, I., Ying, J., & Agarwal, J. (2014). National trends and complication rates after bilateral mastectomy and immediate breast reconstruction from 2005 to 2012. *American Journal of Surgery*, *210*(3), 512-516. https://doi.org/10.1016/j.amjsurg.2015.03.019

Liaw, L., Lin, S., Guo, L., Hou, Y., Hou, M., & Hsu, A. (2013). Ultrasound imaging evaluation of abdominal muscles after breast reconstruction with a unilateral pedicled transverse rectus abdominis myocutaneous flap. *Physical Therapy, 93*(10), 356-368. https://doi.org/10.2522/ptj.20120063

Lipa, J., Youssef, A., Kuerer, H., Robb, J., Chang D. (2003). Breast reconstruction in older women: Advantages of autogenous tissue. *Plastic Reconstr Surg*, *111*(3), 1110–21. DOI:10.1097/01.PRS.0000046614.84464.84

Lipa, J. (2010). Chapter nine: DIEP flap breast reconstruction. E. J. Hall-Findlay & G. Evans (Eds.), *Aesthetic and Reconstructive Surgery of the Breast* (pp. 117-146). Saunders/Elsevier.

Mahmoundi, E., Lu, Y., Metz, A., Momoh, A., & Chung, K. (2017). Association of a policy mandating physician-patient communication with racial/ethnic disparities in postmastectomy breast reconstruction. *Jama Surg*, *152*(8), 775-783. DOI: 10.1001/jamasurg.2017.0921

McCue, J., Miglior, M., & Cunningham, B. (2010). Chapter four: Expanders and breast reconstruction with gel and saline implants. E. J. Hall-Findlay & G. Evans (Eds.), *Aesthetic and Reconstructive Surgery of the Breast* (pp. 29-50). Saunders/Elsevier.

McGinley, L. & Goldstein, A. (2017). What is the ACA Medicaid expansion? Retrieved from https://www.washingtonpost.com/national/2017/live-updates/health-care/obamacare-affordable-care-act-definitions/what-is-the-aca-medicaid-expansion/?noredirect=on&utm_term=.167eb44b4cec

McGuire, K., Santillan, A., Kaur, P., Meade, T., Parbhoo, J., et al. (2009). Are mastectomies on the rise? A 13-year trend analysis of the selection of mastectomy versus breast conservation therapy in 5865 patients. *Ann Surg Oncol*, *16*(10), 2682-2690. https://doi-org.ezproxy.library.unlv.edu/10.1245/s10434-009-0635-x

McGaughey, A. (2006). Body image after bilateral prophylactic mastectomy: An integrative literature review. *Journal of Midwifery & Women's Health, 51*(6), 45-49. DOI:10.1016/j.jmwh.2006.07.002

Miller, A., Steiner, C., Barrett, M., Fingar, K., & Elixhauser, A. (2017). Breast reconstruction surgery for mastectomy in hospital inpatient and ambulatory settings, 2009–2014. Retrieved from https://www.hcup-us.ahrq.gov/reports/statbriefs/sb228-Breast-Reconstruction-For-Mastectomy.pdf

Morrow, M., Scott, S., Menck, H., Mustoe, T., & Winchester, D. (2001). Factors influencing the use of breast reconstruction postmastectomy: A National Cancer Database Study. *Journal of the American College of Surgeons, 192*(1), 1-8. DOI**:** 10.1016/S1072-7515(00)00747-X

Morrow, M., Mujahid, M., Lantz, P., Janz, N., Fangerlin, A., Schwartz, K.,…Katz, S. (2005). Correlates of breast reconstruction: Results from a population-based study. *Cancer, 104*(11), 2340-2346.

Morrow, M., Alderman, A., Jagsi, R., Hamilton, A., Graff, J., Hawley, T., & Katz, S. (2014). Access to breast reconstruction after mastectomy and patient perspectives on reconstruction decision making. *JAMA Surgery, 149*(10), 1015-1021. DOI:10.1001/jamasurg.2014.548

Noone R., Frazier T., Noone G., Blanchet, N., Murphy, J., & Rose, D. (1994). Recurrence of breast carcinoma following immediate reconstruction: A 13-year review. *Plast Reconstr Surg, 93*(1), 96–106.

Noone, R., Goldwin, R., McGrath, M., Spear, S., & Evans, G. (2007). 50th Anniversary plastic surgeon research council panel on the future of academic plastic surgery. *Plastic and Reconstructive Surgery, 120*(6), 1709-1721. DOI: 10.1097/01.prs.0000282308.47851.54

Platt, J., Baxter, N., & Zhong, T. (2011). Breast reconstruction after mastectomy for breast cancer. *CMAJ, 183*(18), 2109-2116. DOI:10.1503/cmaj.110513

Reuben, B., Manwaring, J., & Neumayer, L. (2009). Recent trends and predictors in immediate breast reconstruction after mastectomy in the United States. *The American Journal of Surgery, 198*(2), 237-243. DOI:10.1016/j.amjsurg.2008.11.034

Rubin, L., Chavez, J., Alderman, A., & Pusic, A. (2013). "Use what God has given me": Difference and disparity in breast reconstruction. *Psychol Health, 28*(10), 1099-1120. DOI:10.1080/08870446.2013.782404.

Rural Health Information Hub [RHIhub]. (2019). Nevada. Retrieved from https://www.ruralhealthinfo.org/states/nevada

Shippee, T., Kozhimannil, K., Rowan, K., & Virnig, B. (2014). Health insurance coverage and racial disparities in breast reconstruction after mastectomy. *Women's Health Issues, 24*(3), 261-269. https://doi.org/10.1016/j.whi.2014.03.001

Spiegel, A. & Eldor, L. (2010). Chapter ten: SIEA flap breast reconstruction. E. J. Hall-Findlay & G. Evans (Eds.), *Aesthetic and Reconstructive Surgery of the Breast* (pp. 147-159). Saunders/Elsevier.

Stacey, D., Spring M., Breslin T., Rao V., & Gutowski K. (2008) Exploring the effect of the referring general surgeon's attitudes on breast reconstruction utilization. *WMJ Off Publ State Med Soc Wis., 107*(6), 292-297.

Steiner, C., Weiss, A., Barrett, M., Fingar, K., & Davis, H. (2016). Trends in bilateral and unilateral mastectomies in hospital inpatient and ambulatory settings, 2005–2013. Retrieved from https://www.hcup-us.ahrq.gov/reports/statbriefs/sb201-Mastectomies-Inpatient-Outpatient.pdf

The breast cancer patient education act of 2015, H.R 2540, 114th Congress. (2015).

The breast cancer patient education act of 2015, S.1192, 114th Congress. (2015).

Tseng, J., Kronowitz, S., Sun, C., Perry, A., Hunt, K., Babiera, G.,…Kuerer, H. (2004). The effect of ethnicity on immediate reconstruction rates after mastectomy for breast cancer. *Cancer 101*(7), 1514-1523. DOI: 10.1002/cncr.20529

U.S. Cancer Statistics Working Group, Centers for Disease Control and Prevention and National Cancer Institute. (2018). U.S. Cancer Statistics Data Visualizations Tool, based on November 2017 submission data (1999-2015). Retrieved from https://gis.cdc.gov/Cancer/USCS/DataViz.html

U.S Census Bureau. (2017). Language spoken at home. Retrieved from https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_17_1YR_S1601&prodType=table

Veronesi, P., Lorenzi, F., Ballardini, B., Magnoni, F., Lissidini, G., Caldarella, P., & Galimberti, V. (2011). Immediate breast reconstruction after mastectomy. *The Breast, 20*, 104-107. DOI:10.1016/S0960-9776(11)70305-8

Wanzel, K., Brown, M., Anastakis, D., & Regehr, G. (2002). Reconstructive breast surgery: Referring physician knowledge and learning needs. *Plastic and Reconstructive Surgery, 110*(6), 1441-1450. DOI: 10.1097/01.PRS.0000030458.86726.50

Weiss, P. (2010). Chapter six: TRAM flap breast reconstruction. E. J. Hall-Findlay & G. Evans (Eds.), *Aesthetic and Reconstructive Surgery of the Breast* (pp. 61-80). Saunders/Elsevier.

Willey, S. & Manasseh, D. (2011). Section I: Oncology and oncoplastic surgery, chapter eight: Mastectomy for breast cancer. S. Spear (Ed.), *Surgery of the breast: Principles and art* (2nd ed., pp. 96-106). Philadelphia, PA: Lippincott Williams & Wilkins.

Winters, R., Pou, A., & Friedlander, P. (2011). A “medical mission” at home: The needs of rural America in terms of otolaryngology care. *Journal of Rural Health, 27*(3), 297-301. DOI: 10.1111/j.1748-0361.2010.00343.x

Wong-Pan, L. (2012). Reconstruction coverage Under the Women’s Health and Cancer Rights Act. Retrieved from http://community.breastcancer.org/blog/reconstruction-coverage-under-the-womens-health-and-cancer-rights-act/

Yang, R., Newman, A., Reinke, C., Lin, I., Karakousis, G., Czerniecki, B., Wu, L., & Kelz, R. (2013). Racial disparities in immediate breast reconstruction after mastectomy: Impact of state and federal health policy changes. *Ann Surg Oncol, 20*, 399-406. DOI:10.1245/s10434-012-2607-9

Yoon, A., Qi, J., Brown, D., Kim, H., Hamill, J., Erdmann-Sager, J.,…Wilkins, E. (2018). Outcomes of immediate versus delayed breast reconstruction: Results of a multicenter prospective study. *The Breast, 37*, 72-79. DOI: 10.1016/j.breast.2017.10.009

Curriculum Vitae

Jenna Webb
jennawebb5@gmail.com

Education

University of Nevada, Las Vegas May 2019
Master of Public Health
Enrolled Fall 2016
Anticipated Graduation Date May 2019
Current GPA: 3.9

University of Wisconsin, Platteville May 2015
BS Biology
Enrolled Fall 2010
GPA: 3.1

Professional Experience

University of Nevada, Las Vegas Las Vegas, Nevada January 2017 - Present
Course Instructor GSC 300: Civic Engagement in Urban Communities

- Engaged over 100 undergraduate students in experiential learning highlighting the roles that the private, public, and nonprofit sectors play in urban communities
- Oversaw the successful completion of more than 75 community-based projects including several supporting health issues, homelessness, and education
- Developed curriculum for both the sixteen-week course and five-week course

University of Nevada, Las Vegas Las Vegas, Nevada January 2017 - Present
Community Outreach Graduate Assistant

- In collaboration with the Nevada Homeless Alliance, facilitated the Policy Council on Homelessness with Nevada Homeless Alliance
- Served as the Chair of Research and Development Committee for the Policy Council on Homelessness
- Served as Associate Director of the Community Partnership for Opening Doors (CPOD), a collaboration involving Credit One Bank, other funders, and over 30 other agencies focused on eliminating homelessness in Southern Nevada
- Engaged in outreach with the nonprofit community
- Developed skill-based volunteer opportunities for University of Nevada, Las Vegas students

Nevada Medical Center Las Vegas, Nevada May 2017 - January 2018
Data analytic Intern

- Assisted in drafting the 2017 Healthcare Report Card
- Assisted in organizing and selecting data for the NMC data portal
- Collected and analyzed data for the Global Science of Play sites

Certificates and Licenses

Collaborative Institutional Training Initiative (CITI)

Human Research Group 2. Social/Behavioral IRB Basic Course	01/28/2019
Human Research Group 1. Biomedical IRB Course 1 – Basic Course	10/17/2019
Responsible Conduct of Research Biomedical Responsible Conduct of Research	07/23/2017
Responsible Conduct of Research Social and Behavioral Responsible Conduct of Research	07/23/2017

Alaska Department of Health and Social Services

Emergency Medical Technician- 1 License number: 10169005	06/21/2010 - 12/31/2011