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Variation in receipt of adjuvant chemotherapy among breast cancer patients in Georgia utilizing augmented Georgia Cancer Registry data

By

Alli Lauren Gombolay

Degree to be awarded: Master of Public Health

Department of Epidemiology

Dr. Kevin C. Ward

Faculty Thesis Advisor

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Alli Lauren Gombolay

Bachelor of Science, Georgia Institute of Technology, 2013

Faculty Thesis Advisor: Kevin C. Ward, Ph.D., M.P.H., C.T.R.

An abstract of

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By Alli Lauren Gombolay

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Background: Despite the health benefits of adjuvant chemotherapy, many women do not receive adequate breast cancer treatment. We present the first evaluation of variation in receipt of guideline-concordant adjuvant chemotherapy among breast cancer patients in Georgia using data from the Georgia Cancer Registry (GCR) augmented with medical insurance claims data.

Data Sources: Case-specific data for 1,090 women who were diagnosed with their first primary, early-stage hormone receptor negative breast cancer between 2002-2005 were bilaterally linked between the GCR and Medicare, Medicaid, State Health Benefit Plan (SHBP), and Kaiser Permanente of Georgia (KPG) claims data.

Study Design: Using predictive multivariable logistic regression, we analyzed the factors that are associated with receipt of guideline-concordant adjuvant chemotherapy.

Findings: As indicated by the augmented GCR data, nearly 90% of the patients received guideline-concordant adjuvant chemotherapy compared to only 79.17% of the patients as indicated by the GCR data. Over 90% of the patients with stage II and stage III disease adhered to therapy. The gain in completeness of data capture for adjuvant chemotherapy varied depending on the source (Medicare 7.23%; Medicaid 8.50%; SHBP 12.27%; and KPG 29.00%). In multivariate analysis, women age 55-64 years (OR = 0.54) and women age 65-83 years (OR = 0.32) were less likely to receive guideline-concordant therapy compared to younger women. Non-white women (OR = 0.59) were less likely to receive guideline-concordant therapy compared to white women. Unmarried women (OR = 0.44) were less likely to receive guideline-concordant therapy compared to married women. Women with stage II disease (OR = 3.69) were more likely to receive guideline-concordant therapy compared to women with stage I disease.

Conclusions: Younger age, being white, being married, and later stage of disease were associated with receipt of guideline-concordant adjuvant chemotherapy. Addressing the factors that lead to non-concordance may reduce variation in treatment and survival.

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Table of Contents

Chapter I: **Background/Literature Review**

Breast cancer is the most commonly diagnosed cancer in women and the second most common cause of cancer death (1). In 2015, the American Cancer Society estimates that approximately 40,290 women in the U.S. will die from breast cancer (1). Although screening and early detection are the most effective methods to prevent death from breast cancer, adjuvant therapy (chemotherapy, radiation, and/or hormonal therapy given after surgical management) is a key component in the treatment of breast cancer (1). Adjuvant therapy has been shown to significantly reduce disease recurrence and improve survival among women diagnosed with early-stage breast cancer (2, 3).

The National Institutes of Health (NIH) and several other leading medical organizations have developed evidence-based recommendations regarding the use of adjuvant therapy for breast cancer (4, 5). Numerous randomized control trials and population-based studies have shown that adjuvant therapies are effective in reducing disease recurrence and improving survival in early stage breast cancer (3, 6-11). For maximum effect, the planned treatment should be administered until completion (6, 7).

However, despite the well-documented health benefits of adjuvant therapy, in 1990, the Institute of Medicine's (IOM) National Cancer Policy Board issued reports stating that many Americans do not receive adequate quality cancer treatment (12). Studies have found that receipt of adjuvant therapy varies by several non-clinical factors, including age, race, socioeconomic status (SES), and treatment facility characteristics. Older age has been shown to be inversely associated with receipt of adjuvant therapy (13, 14). Compared to white women, black women have been shown to be less likely to receive adjuvant chemotherapy (15, 16). Lower SES has been shown to be associated

with receipt of non-guideline chemotherapy (17). Treatment at hospitals not approved by the American College of Surgeons' Commission on Cancer (CoC) has been shown to be associated with receipt of non-guideline chemotherapy (17).

In 2010, the IOM's National Cancer Policy Forum issued a report stating a novel approach to improving cancer care quality: the creation of "a rapid learning system for cancer care" (18). Such a data system should use information technology to automatically collect cancer care information from clinical practices, disease registries, clinical trials, and other sources of information to inform providers, patients, payers, and public agencies regarding the impact of cancer therapies on health outcomes (19). Central cancer registries, including the National Cancer Institute's (NCI) Surveillance, Epidemiology, and End Results (SEER) Program; the Centers for Disease Control and Prevention's (CDC) National Program of Cancer Registries; and the Commission on Cancer's National Cancer Data Base, typically collect information on demographics, primary type of cancer, stage at diagnosis, histology, grade, hormonal status, first course of treatment, codes for treating physicians, and patient survival status. However, detailed information on adjuvant therapies, disease recurrence, patient-reported outcomes, and other information relevant for assessing quality of cancer care is not typically reported. Consequently, the IOM recommended that the central cancer registries should be linked with external sources to better support research into quality of cancer care, effectiveness, and cost (18). Since this recommendation, several data linkages have been developed, including registry-administrative/claims (i.e., SEER-Medicare, SEER-Medicaid, SEER-Commercial Insurance Data), registry-medical records-administrative/claims-provider characteristics (i.e., CDC's Breast and Prostate Cancer Data Quality and Patterns of Care

Study), registry-medical records-patient reports (i.e., NCI's Prostate Cancer Outcomes Study), and registry-medical records-patient/physician/caregiver reports (i.e., NCI-Veterans Affairs Cancer Care Outcomes Research and Surveillance Consortium (19).

Although significant progress has been made in research into quality of cancer care, the United States still lacks a population-based data system for identifying cancer patients and tracking detailed treatment and outcomes other than survival over time. Lipscomb and Gillespie argue that, in the context of the U.S. health care system, the state should serve as a "laboratory" for developing a learning health care system for quality of cancer care, as well as effectiveness, safety, and economic value of cancer care (19). In 2009, the Association of Schools of Public Health and the CDC awarded Lipscomb et al. of Emory University a grant to support the project, "Using Cancer Registry and Other Data Sources to Track Measures of Care in Georgia". For this project, Lipscomb et al. have bilaterally linked case-specific data from the GCR to Medicare, Medicaid, State Health Benefit Plan (SHBP), and Kaiser Permanente of Georgia (KPG) medical insurance claims data with the goal of assessing quality of cancer care in Georgia.

In response to the reports by the IOM, the National Quality Forum (NQF) launched the Cancer Quality Measures Project in 2002 to identify evidence-based measures of cancer care quality (20). The IOM defines health care quality as "the degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge" (21). From a population perspective, the ideal of health care quality is "credible evidence of appropriate care as indexed by predefined performance indicators of quality" (19). Based on this project, the NQF developed breast cancer quality measure #0559. According to

measure #0559, adjuvant chemotherapy should be considered or administered to women age 18-69 years within 4 months of diagnosis with their first primary hormone receptor negative (ER-/PR-) breast cancer (epithelial malignancy) at American Joint Committee on Cancer (AJCC) stage 1 (T1cN0M0 only), stage II, or stage III (20). To assess the quality of cancer care in Georgia, we will assess adherence to the NQF breast cancer quality measure for adjuvant chemotherapy using GCR data augmented with multiple private and public medical insurance claims data. In doing so, we will be able to measure the degree to which augmenting state cancer registry data improves the completeness of data capture for adjuvant chemotherapy. We will also be able to gain a better understanding of the factors that best predict receipt of guideline-concordant therapy.

Chapter II: **Manuscript**

Variation in receipt of adjuvant chemotherapy among breast cancer patients in Georgia utilizing augmented Georgia Cancer Registry data

Alli Gombolay, Kevin C. Ward, Joseph Lipscomb

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Findings: As indicated by the augmented GCR data, nearly 90% of the patients received guideline-concordant adjuvant chemotherapy compared to only 79.17% of the patients as indicated by the GCR data. Over 90% of the patients with stage II and stage III disease adhered to therapy. The gain in completeness of data capture for adjuvant chemotherapy varied depending on the source (Medicare 7.23%; Medicaid 8.50%; SHBP 12.27%; and KPG 29.00%). In multivariate analysis, women age 55-64 years (OR = 0.54) and women age 65-83 years (OR = 0.32) were less likely to receive guideline-concordant therapy compared to younger women. Non-white women (OR = 0.59) were less likely to receive guideline-concordant therapy compared to white women. Unmarried women (OR = 0.44) were less likely to receive guideline-concordant therapy compared to married women. Women with stage II disease (OR = 3.69) were more likely to receive guideline-concordant therapy compared to women with stage I disease.

Conclusions: Younger age, being white, being married, and later stage of disease were associated with receipt of guideline-concordant adjuvant chemotherapy. Addressing the factors that lead to non-concordance may reduce variation in treatment and survival.

INTRODUCTION

Breast cancer is the most commonly diagnosed cancer in women and the second most common cause of cancer death (1). In 2015, the American Cancer Society estimates that approximately 40,290 women in the U.S. will die from breast cancer (1). Although screening and early detection are the most effective methods to prevent death from breast cancer, adjuvant therapy (chemotherapy, radiation, and/or hormonal therapy given after surgical management) is a key component in the treatment of breast cancer (1). Adjuvant therapy has been shown to significantly reduce disease recurrence and improve survival among women diagnosed with early-stage breast cancer (2, 3).

Despite the well-documented health benefits of adjuvant therapy, in 1990, the Institute of Medicine's (IOM) National Cancer Policy Board issued reports stating that many Americans do not receive adequate quality cancer treatment (12). Studies have found that receipt of adjuvant therapy varies by several non-clinical factors, including age, race, socioeconomic status (SES), and treatment facility characteristics (approved by the Commission on Cancer (CoC) or not) (13-17).

In 2010, the IOM's National Cancer Policy Forum issued a report stating a novel approach to improving cancer care quality: the creation of "a rapid learning system for cancer care" (18). Such a data system should use information technology to automatically collect cancer care information from clinical practices, disease registries, clinical trials, and other sources of information to inform providers, patients, payers, and public agencies regarding the impact of cancer therapies on health outcomes (19). Central cancer registries, such as the National Cancer Institute's (NCI) Surveillance, Epidemiology, and End Results (SEER) Program, typically collect information on

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In response to the reports by the IOM, the National Quality Forum (NQF) launched the Cancer Quality Measures Project in 2002 to identify evidence-based measures of cancer care quality (20). Based on this project, the NQF developed breast cancer quality measure #0559. According to measure #0559, adjuvant chemotherapy

should be considered or administered to women age 18-69 years within 4 months of diagnosis with their first primary hormone receptor negative (ER-/PR-) breast cancer (epithelial malignancy) at American Joint Committee on Cancer (AJCC) stage I (T1cN0M0 only), stage II, or stage III (20). To assess the quality of cancer care in Georgia, we will assess adherence to the NQF breast cancer quality measure for adjuvant chemotherapy using GCR data augmented with multiple private and public medical insurance claims data. In doing so, we will be able to measure the degree to which augmenting state cancer registry data improves the completeness of data capture for receipt of adjuvant chemotherapy. We will also be able to gain a better understanding of the factors that best predict receipt of guideline-concordant therapy.

METHODS

Study Population

The study population consisted of 1,090 women age 18-69 years who were living in Georgia at the time they were diagnosed with their first primary ER-/PR- breast cancer (epithelial malignancy) at AJCC stage I (T1cN0M0 only), stage II, or stage III between 2002 and 2005. The women included in the study population were to have adjuvant chemotherapy considered or administered within 4 months of the date of diagnosis. Incident cases of breast cancer were identified from the GCR. Case-specific data from the GCR were bilaterally linked to four sources of medical insurance claims data in Georgia, including Medicare, Medicaid, SHBP, and KPG. We excluded patients who did not have data for each of the explanatory variables of interest (n = 33).

Definition of Guideline-Concordant Adjuvant Therapy

We studied the binary (yes/no) outcome, receipt of guideline-concordant adjuvant chemotherapy, which was defined based on the guidelines developed by the NQF as part of the Cancer Quality Measures Project. According to the NQF, adjuvant chemotherapy should be considered or administered to women age 18-69 years within 4 months of diagnosis with their first primary ER-/PR- breast cancer (epithelial malignancy) at AJCC stage I (T1cN0M0 only), stage II, or stage III (20). If any of the five sources of data (GCR, Medicare, Medicaid, SHBP, or KPG) indicated the patients had received adjuvant chemotherapy within 4 months of diagnosis, we considered chemotherapy to have been administered according to guidelines.

Explanatory Variables of Interest

Based on previous studies, we decided to analyze factors that have been shown to be associated with adherence to cancer treatment. Explanatory variables of interest for analyses of guideline-concordant adjuvant chemotherapy included age at diagnosis, race, martial status, AJCC stage at diagnosis, year of diagnosis, region of residence, urban/rural status, socioeconomic status (SES), and type of treatment facility. Age at diagnosis was categorized into 18-54, 55-64, and 65-69 years. Race was categorized into white and non-white (approximately 97% of the non-white category was black). Marital status was categorized into married and not married (never married, separated, divorced, widowed, or domestic partner). Stage of breast cancer was categorized into AJCC stage I (T1cN0M0 only), stage II, or stage III. In the GCR, some of the cases were classified as stage I/II (22 (1.96%)) or stage II/III (20 (1.78%)). Since there was not enough

information to discriminate between the two stages, the mixed stages were down-staged (i.e., stage I/II was down-staged to stage I and stage II/III was down-staged to stage II) for the purpose of this study. The county in which patients lived at the time of diagnosis was used to categorize the region of residence into Atlanta (five counties covered by the Metropolitan Atlanta SEER Registry since 1975: Clayton, Cobb, DeKalb, Fulton, and Gwinnett counties) and the rest of the state of Georgia outside these counties. Rural-urban commuting area (RUCA) codes based on population density, urbanization, and level of daily commuting in the U.S. census tract in which patients were diagnosed was used to categorize the urban/rural status into metropolitan, micropolitan, and small town/rural areas (22). Since cancer registries derive information regarding SES at the residential census tract level rather than at the individual level, SES was categorized into 0-5, 5-10, 10-20, and 20-100 percent of the population in a particular census tract living below the federal poverty level. The type of treatment facility at which the patient was treated was categorized into Commission on Cancer (CoC)-approved facility or not. CoC-approved facilities follow a set of rigorous standards to ensure high quality, patient-centered cancer care and optimal patient outcomes.

Statistical Analyses

First, we analyzed the percent agreement between the GCR and the four sources of medical insurance claims (Medicare, Medicaid, SHBP, and KPG) regarding receipt of guideline-concordant adjuvant chemotherapy. By analyzing the percent agreement, we were able to measure the degree to which augmenting state registry data improves the completeness of data capture for adjuvant chemotherapy.

Next, for the outcome, guideline-concordance for adjuvant chemotherapy, we conducted univariate analyses with each of the explanatory variables of interest using χ^2 tests accompanied by two-sided *p* values. Two-sided *p* values less than 0.05 were considered statistically significant. Guided by these findings, we developed a predictive multivariable logistic regression model that included all of the explanatory variables of interest, including age at diagnosis, race, martial status, AJCC stage at diagnosis, year of diagnosis, region of residence, urban/rural status, SES, and type of treatment facility. The predictive model was used to identify factors independently associated with receipt of guideline-concordant therapy, while controlling for other covariates in the model. Logistic regression results were expressed as adjusted odd ratios, with corresponding 95% confidence intervals (CI).

Analyses were conducted using SAS Version 9.4 (SAS Institute, Cary, NC, USA). This study was approved by the institutional review boards at Emory University and the Georgia Department of Public Health.

RESULTS

Percent agreement between the Georgia Cancer Registry and medical insurance claims in receipt of guideline-concordant adjuvant chemotherapy

When considering all of the sources of medical insurance claims combined, the GCR and the claims showed concordance for 805 (73.85%) of the 1,090 patients receiving guideline-concordant adjuvant chemotherapy and 112 (10.28%) not receiving guideline-concordant adjuvant chemotherapy. The GCR indicated 58 (5.32%) of the 1,090 patients received guideline-concordant therapy when the claims did not. In

contrast, the claims indicated 115 (10.55%) of the 1,090 patients received guideline-concordant therapy when the GCR did not.

Depending on the source of the medical insurance claims, there was a gain in the completeness of data capture for receipt of guideline-concordant adjuvant chemotherapy ranging from 7.23% to 29.00% (Table 1). For Medicare, 23 of 318 claims (7.23%) indicated the patients received guideline-concordant therapy when the GCR indicated the patients did not. For Medicaid, 47 of 553 claims (8.50%) indicated the patients received guideline-concordant therapy when the GCR indicated the patients did not. For the SHBP, 33 of 269 claims (12.27%) indicated the patients received guideline-concordant therapy when the GCR indicated the patients did not. For KPG, 29 of 100 claims (29.00%) indicated the patients received guideline-concordant therapy when the GCR indicated the patients did not.

Receipt of guideline-concordant adjuvant chemotherapy

As indicated by either the GCR or any source of medical insurance claims, 978 (89.72%) of the 1,090 patients received guideline-concordant adjuvant chemotherapy compared to only 79.17% as indicated by the GCR data. In addition, 552 (92.62%) of the 596 patients with stage II disease and 223 (93.70%) of the 238 patients with stage III disease adhered to therapy.

23.49% of the patients had AJCC stage I (T1cN0M0 only) disease, 54.68% had stage II disease, and 21.83% had stage III disease. Most of the patients were between 18-54 years (56.97%), about half were white (51.74%), and about half were married (49.82%). Most of the patients lived in higher poverty areas, in metropolitan settings

(69.45%), and outside of Atlanta (67.52%). The majority of the patients were treated at CoC-approved facilities (87.80%).

In univariate analysis, receipt of guideline-concordant therapy was positively and statistically significantly associated with younger age at diagnosis, being white, being married, later stage at diagnosis, and later year of diagnosis. Although not statistically significant, receipt of guideline-concordant therapy was positively associated with being treated at a CoC-approved facility (Table 2).

In multivariate analysis, women age 55-64 years (OR = 0.54; 95% CI, 0.33-0.89) and 65-69 years (OR = 0.32, 95% CI, 0.19-0.54) were less likely to receive guideline-concordant adjuvant chemotherapy compared to women age 18-54 years. Non-white women (OR = 0.59; 95% CI, 0.37-0.95) were less likely to receive guideline-concordant therapy compared to white women. Unmarried women (OR = 0.44; 95% CI, 0.28-0.69) were less likely to receive guideline-concordant therapy compared to married women. Women with AJCC stage II disease (OR = 3.69; 95% CI, 2.33-5.85) were more likely to receive guideline-concordant therapy compared to women with AJCC stage I (T1cN0M0 only) disease (Table 3).

DISCUSSION

This study presents the first evaluation of variation in receipt of guideline-concordant adjuvant chemotherapy among breast cancer patients in Georgia using GCR data augmented with medical insurance claims data. Augmenting the GCR data helped to improve the completeness of data capture for receipt of adjuvant chemotherapy. By capturing more of the case-specific data, we were better able to assess the quality of breast cancer care in Georgia. When using the augmented GCR data, we were able to

determine nearly 90% of the patients (an additional 10.55%) received guideline-concordant therapy compared to only 79% when using the GCR data. In addition, over 90% of patients with stage II and stage III disease adhered to therapy.

Despite the well-documented health benefits of adjuvant chemotherapy, we found substantial variation in receipt of guideline-concordant adjuvant chemotherapy among the women in our study. In multivariate analysis, several factors were associated with receipt of guideline-concordant adjuvant chemotherapy. Compared to younger women, women who were diagnosed with breast cancer between 55-64 years were about 46% less likely to receive guideline-concordant therapy and women who were diagnosed between 65-69 years were about 68% less likely to receive guideline-concordant therapy. Compared to white women, non-white women were about 41% less likely to receive guideline-concordant therapy. Compared to married women, unmarried women were about 56% less likely to receive guideline-concordant therapy. Compared to women diagnosed with stage I breast cancer, women diagnosed with stage II breast cancer were about 3.7 times more likely to receive guideline-concordant therapy.

Previous studies have shown marital status is positively associated with treatment adherence and survival of cancer patients (23, 24). Marital status may serve as a proxy for social support. Older, unmarried women may be more likely to decline more aggressive therapy regimens due to concerns about who might help them with post-operative care, out-of-pocket costs, and transportation (25). In addition, previous studies have shown lower rates of adjuvant therapy among black women compared to white women (11, 15, 16, 26). Furthermore, previous studies have shown increasing age is inversely associated with receipt of adjuvant therapy (13, 14).

In terms of strengths, this study provides the first evaluation of factors that are associated with receipt of guideline-concordant adjuvant chemotherapy among breast cancer patients in Georgia using GCR data augmented with medical insurance claims data. Since we used data from a variety of sources, the analyses presented in this study included the most complete and representative group of breast cancer patients as possible. However, this study has some notable limitations. First, since this study focuses only on patients who live in Georgia, our findings may not be generalizable to women who live in other states. Second, since our results reflect the patterns of care for patients diagnosed in Georgia from 2002-2005, our findings may not be generalizable over time. Third, since we used population-level information rather than individual-level information for socioeconomic status, our SES variable may not accurately reflect the SES of some of the patients. Fourth, the NQF guideline indicates that adjuvant therapy should be considered or administered if the patient meets the eligibility criteria; however, we were not able to assess whether the therapy was considered. Fifth, the GCR indicated 58 (5.32%) of the 1,090 patients received guideline-concordant therapy when the medical insurance claims did not. Although we are not able to identify the reason for this discordance, it is possible another payer covered the cost of the adjuvant therapy.

Despite these limitations, this study presents important findings regarding adherence to cancer treatment guidelines and variation in receipt of guideline-concordant adjuvant chemotherapy. Previous studies have shown that non-adherence to breast cancer treatment guidelines is associated with higher recurrence of cancer and rates of mortality (27). Addressing the factors that lead to non-concordance may improve breast cancer outcomes among all women. Future studies should assess the impact of the

variation in guideline-concordant adjuvant therapy observed in this study on survival. The findings presented in this study could have important implications for the treatment of breast cancer in the United States.

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TABLES

Table 1: Percent agreement between GCR and sources of medical insurance claims in receipt of NQF guideline-concordant adjuvant chemotherapy

Source of medical insurance claims		**Georgia Cancer Registry**	
Medicare		Yes	No
	Yes	220 (69.18%)	23 (7.23%)
	No	17 (5.35%)	58 (18.24%)
			Total = 318
Medicaid		Yes	No
	Yes	408 (73.78%)	47 (8.50%)
	No	45 (8.14%)	53 (9.58%)
			Total = 553
State Health Benefit Plan		Yes	No
	Yes	191 (71.00%)	33 (12.27%)
	No	25 (9.29%)	20 (7.43%)
			Total = 269
Kaiser Permanente		Yes	No
	Yes	63 (63.00%)	29 (29.00%)
	No	0 (0.00%)	8 (8.00%)
			Total = 100
Any source		Yes	No
	Yes	805 (73.85%)	115 (10.55%)
	No	58 (5.32%)	112 (10.28%)
			Total = 1,090

Table 2: Receipt of NQF guideline-concordant adjuvant chemotherapy by demographic and clinical characteristics

Characteristic	N(%) of patients (N = 1,090)	N(%) of patients who did not receive guideline-concordant therapy (N = 112)	N(%) of patients who received guideline-concordant therapy (N = 978)	χ^2 p-value
Age at diagnosis (years)				
18 - 54	621 (56.97%)	43 (38.39%)	578 (59.10%)	
55 - 64	269 (24.68%)	33 (29.46%)	236 (24.13%)	
65 - 69	200 (18.35%)	36 (32.14%)	164 (16.77%)	< 0.0001
Race				
White	564 (51.74%)	47 (41.96%)	517 (52.86%)	
Non-white	526 (48.26%)	65 (58.04%)	461 (47.14%)	0.029
Marital status				
Married	543 (49.82%)	37 (33.04%)	506 (51.74%)	
Not married	547 (50.18%)	75 (66.96%)	472 (48.26%)	0.0002
AJCC stage at diagnosis				
Stage I (T1cN0M0 only)	256 (23.49%)	53 (47.32%)	203 (20.76%)	
Stage II	596 (54.68%)	44 (39.29%)	552 (56.44%)	
Stage III	238 (21.83%)	15 (13.39%)	223 (22.80%)	< 0.0001
Year of diagnosis				
2002	232 (21.28%)	17 (15.18%)	215 (21.98%)	
2003	238 (21.83%)	18 (16.07%)	220 (22.49%)	
2004	304 (27.89%)	34 (30.36%)	270 (27.61%)	
2005	316 (28.99%)	43 (38.39%)	273 (27.91%)	0.043
Region of residence				
Atlanta	354 (32.48%)	43 (38.39%)	311 (31.80%)	
Other	736 (67.52%)	69 (61.61%)	667 (68.20%)	0.158
Urban/rural status				
Metropolitan	757 (69.45%)	79 (70.54%)	678 (69.33%)	
Micropolitan	165 (15.14%)	17 (15.18%)	148 (15.13%)	
Small town/rural	168 (15.41%)	16 (14.29%)	152 (15.54%)	0.940
SES (% below poverty level)				
20% - 100% of population	337 (30.92%)	41 (36.61%)	296 (30.27%)	
10% - less than 20% of population	370 (33.94%)	36 (32.14%)	334 (34.15%)	
5% - less than 10% of population	209 (19.17%)	17 (15.18%)	192 (19.63%)	
0% - less than 5% of population	174 (15.96%)	18 (16.07%)	156 (15.95%)	0.481
Type of treatment facility				
CoC-approved facility	957 (87.80%)	92 (82.14%)	865 (88.45%)	
Not CoC-approved facility	133 (12.20%)	20 (17.86%)	113 (11.55%)	0.054

Table 3: Adjusted odds ratios for receipt of NQF guideline-concordant adjuvant chemotherapy

Characteristic	Odds ratio	95% CI
Age at diagnosis (years)		
18 - 54	1.00	
55 - 64	0.54	0.33-0.89
65 - 69	0.32	0.19-0.54
Race		
White	1.00	
Non-white	0.59	0.37-0.95
Marital status		
Married	1.00	
Not married	0.44	0.28-0.69
AJCC stage at diagnosis		
Stage I (T1cN0M0 only)	1.00	
Stage II	3.69	2.33-5.85
Stage III	1.17	0.63-2.19
Year of diagnosis		
2002	1.00	
2003	0.97	0.48-1.99
2004	0.64	0.34-1.21
2005	0.91	0.54-1.51
Region of residence		
Atlanta	1.00	
Other	1.40	0.84-2.34
Urban/rural status		
Metropolitan	1.00	
Micropolitan	0.95	0.49-1.84
Small town/rural	1.00	0.46-2.17
SES (% below poverty level)		
20% - 100% of population	1.00	
10% - less than 20% of population	1.06	0.63-1.77
5% - less than 10% of population	1.18	0.61-2.25
0% - less than 5% of population	0.71	0.34-1.48
Type of treatment facility		
CoC-approved facility	1.00	
Not CoC approved facility	0.60	0.34-1.08

Chapter III:

Summary

This study presents the first evaluation of variation in receipt of guideline-concordant adjuvant chemotherapy among breast cancer patients in Georgia using GCR data augmented with medical insurance claims data. Augmenting the GCR data helped to improve the completeness of data capture for receipt of adjuvant chemotherapy. By capturing more case-specific data, we were better able to assess the quality of breast cancer therapy in Georgia. When using the augmented GCR data, we were able to determine nearly 90% of the patients (an additional 10.55%) received guideline-concordant therapy compared to only 79.17% when using the GCR data.

Despite the well-documented health benefits of adjuvant chemotherapy, we found substantial variation in receipt of guideline-concordant adjuvant chemotherapy among the women in our study. In multivariate analysis, several factors were associated with receipt of guideline-concordant adjuvant chemotherapy. Compared to younger women, women who were diagnosed with breast cancer between 55-64 years were about 46% less likely to receive guideline-concordant therapy and women who were diagnosed between 65-83 years were about 68% less likely to receive guideline-concordant therapy. Compared to white women, non-white women were about 41% less likely to receive guideline-concordant therapy. Compared to married women, unmarried women were about 56% less likely to receive guideline-concordant therapy. Compared to women diagnosed with stage I breast cancer, women diagnosed with stage II breast cancer were about 268% more likely to receive guideline-concordant therapy.

Public Health Implications

Based on our findings regarding the value of augmenting a state cancer registry with medical insurance claims data, other state cancer registries should also consider also augmenting their registries to help them to better assess the quality of cancer therapy in their particular state. In addition, since non-adherence to cancer treatment guidelines is associated with higher recurrence of cancer and rates of mortality, public health professionals should develop strategies to address the factors that lead to non-adherence in an effort to improve breast cancer outcomes among all patients.

Possible Future Directions

In the future, we plan to assess the factors that are associated with adherence to the NQF breast cancer quality measure for adjuvant hormone therapy among breast cancer patients in Georgia. We also plan to explore reasons for any discordance between the GCR and the medical insurance claims, particularly when the GCR indicates receipt of adjuvant therapy and the claims do not. Work will also continue to expand the sources of medical insurance claims data available for linkage in Georgia to include as many other insurance providers as possible.