2016

Factors Associated With Late Stage Diagnosis of Cervical Cancer in the United States

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2016

Abstract

Factors Associated With Late Stage Diagnosis of Cervical Cancer in the United States

by

Marianne S. Pelletier

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

Public Health

Walden University

February 2016

Abstract

Cervical cancer represents a significant public health problem in the United States. According to the Centers for Disease Control and Prevention, the prognosis is related to stage at diagnosis, with the 5-year survival rate being 91.2% for early stage disease and only 17.0% for those with late stage disease. There is a gap in the literature examining the association of insurance status with late stage cervical cancer diagnosis across a large segment of the United States population. There is also a gap in the literature examining women residing in the United States with late stage cervical cancer diagnosis and identifying their country of birth. Guided by Andersen's behavioral model of healthcare utilization, this study used the Surveillance, Epidemiology, and End Results database, which includes over 28% of the United States population. The independent variables used were insurance, country of birth, race/ethnicity, age at diagnosis, and marital status. The dependent variable was stage at diagnosis. This cross sectional study included data from 7,445 women across the United States for the years 2008-2012. Two-way tests of association and logistic regression were used to analyze the data. The logistic regression (full model) was statistically significant and found that women born outside of the United States have a lower risk of late stage cervical cancer diagnosis and that unmarried women have a greater risk of late stage diagnosis. This study should send a signal to healthcare providers, as well as public health organizations, to direct their actions toward targeting groups that are now being diagnosed with late stage disease.

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Dedication

I want to dedicate this dissertation to my husband, Michael, my mother, Margaret, and to my children, Teddy, Maureen, and Linda.

Acknowledgments

I want to thank my husband with all my heart; he has been a huge support through this journey in my life. My husband encouraged me to get this done and he understood when I had to miss family functions because I was busy writing. I also want to thank my family and friends for being patient with me while I did not have the extra time to invest in our relationships. My faithful companions, Brewster and Lucy, were always laying at my feet keeping me company through all hours of the night, making sure I took breaks every once in a while. I especially want to thank Dr. Namgyal Kyulo and Dr. James Rohrer for all their expert guidance through this process and their patience with my learning curve. I could not have accomplished this without you.

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Chapter 1: Introduction to the Study

Introduction

According to the National Institutes of Health (NIH), cervical cancer is a disease for which disparities in outcomes could be mitigated (NIH, 1996). Cervical cancer can be easily and inexpensively detected, and its treatment is effective when the disease is caught in the early stages (NIH, 1996). Cervical cancer represents a significant public health problem in the United States. According to the Centers for Disease Control and Prevention (CDC; 2013) in the year 2010 in the United States, there were 11,818 women diagnosed with cervical cancer and 3,939 women died. The prognosis is strongly related to stage at diagnosis with the 5 year survival rate being 91.2% for early stage disease and only 17.0% for those with late stage disease (Altekruse, Kosary, Krapcho, Neyman, & Aminou, 2010).

This chapter introduces the problem, purpose, and nature of this study. In addition, this chapter includes the research questions and hypotheses, the theoretical framework on which the study is based, along with the nature of the study. Study limitations and significance will also be discussed.

Background

The literature reviewed demonstrated that the incidence of cervical cancer is higher in low income women, and Medicaid insureds constitute almost 25% of women diagnosed with cervical cancer in the United States (Weiss-Jibaja, Volk, Kingery, Smith, & Holcomb, 2003). However, according to Fedewa, et al. (2012), there is not enough information known about women with late stage diagnosis of cervical cancer and whether the type of insurance coverage, a surrogate measure for access to care, is associated with their late diagnosis. Fedewa et al.

examined women from selective Commission on Cancer accredited sites and found that women who were uninsured are at a higher risk of having a late stage cervical cancer diagnosis than women with Medicaid insurance. Weiss-Jijaba et al. (2003) examined low income and minority women from Texas with late stage cervical cancer diagnoses and determined that both uninsured women and women insured by Medicaid had more late stage diagnoses than women with other insurance. Getting access to care is not only important for cervical cancer patients in order to benefit from available treatment options, but also for informing early screening and prevention efforts at the population level (American Cancer Society, 2008).

Altekruse et al. (2010) examined the 5 year survival prognosis of being diagnosed with cervical cancer. Their conclusion was that the 5 year survival rate is 91.2% for women diagnosed in an early stage of the disease versus only 17.0% for women diagnosed in the late stages of the disease. This is important because if caught early with effective screening programs more lives will be saved.

Fedewa et al. (2012) examined data on 69,739 cervical cancer patients aged 21-85 years from the National Cancer Database. The objective of the study was to examine the relationship of insurance status and age with the stage of cervical cancer at diagnosis. Adjustments were made for race/ethnicity and socioeconomic factors(Fedewa et al.) Results yielded evidence for a positive relationship with the proportion of late-stage disease increasing with age from 16.53% (21-34 years) to 42.44% (>/= 70 years) (Fedewa et al.). Advanced-stage disease among women aged 50 years and older had a risk that was 2.2 to 2.5 times that of patients aged 21 to 34 years (Fedewa et al.). Uninsured women had a Risk Ratio (RR) of 1.44 of being diagnosed with late stage disease; women covered by Medicaid had a RR of 1.37 and younger Medicare recipients had a RR of 1.12 versus older Medicare recipients having a RR of 1.20 (Fedewa et al.). Medicare recipients overall had a higher risk of being diagnosed with late stage disease compared to the privately insured women(Fedewa et al.). A limitation of the Fedewa et al. study is that data examined was collected by the Commission on Cancer (COC) facilities, and therefore, most of the cases resided in selective large urban areas and not in suburban and rural areas. According to Bilimoria, Bentrem, Stewart, Winchester, and Ko (2009), COC accredited facilities are located in large urban areas due to their size and are much larger than the smaller nonaccredited COC accredited COC facilities. Fedewa et al. did not look at the country of birth as a variable and the results of this study cannot be generalized to women outside of large urban cities.

Weiss-Jibaja, Volk, Kingery, Smith, and Holcomb (2003) examined 1,574 urban low income and minority women. They found that women who had Medicaid insurance were more likely to be diagnosed with late stage cervical cancer. The limitation to this study is that only women from selective urban areas of Texas were studied, and therefore, the results cannot be generalized to the national population.

Polednak (2003) used a public database that included data from the Connecticut Tumor Registry to examine the trend in late stage diagnosis incidence rates for breast and cervical cancer. The objective of Polednak’s study was to determine if there was an impact on the late stage incidence of cervical and breast cancer with the use of a statewide screening program launched in late 1995 targeting lower income and uninsured women. The results demonstrated that African American women from all age groups benefited from a decline in the late stage diagnosis of cervical cancer; however, only African American women aged 65 and over benefited from a decline in breast cancer late stage incidence (Polednak). A limitation of

Polednak's study was that the results can only be generalized to women in the state of Connecticut and the country of birth of the women was not examined as a variable.

Redaniel et al. (2009) analyzed Surveillance, Epidemiology, and End Results (SEER) data comparing Filipino Americans with Caucasian Americans and their International Federation of Gynecology and Obstetrics (FIGO)stage at the time of cervical cancer diagnosis. For women less than 40 years of age, the proportion of Filipino Americans diagnosed with stage IV disease were twice that of Caucasian women (5.19% versus 2.39%; Redaniel). In direct contrast, Caucasian women aged 60 and over were diagnosed more often with stage IV disease as compared with Filipino American women (14.94% versus 7.64%; Redaniel). When controlled for age, Caucasians had a slightly higher mortality rate versus Filipino Americans (RR= 1.22; Redaniel). Although Redaniel et al.'s study had a large sample size of 14,500 patients, it did not examine insurance status or country of birth as variables.

Hatcher, Studts, Dignan, Turner, and Schoenberg (2011) conducted interviews with women who were rarely or never screened for cervical cancer to identify the predominant barriers to papinocular smear (pap) testing. A total of 345 women with a mean age of 51 living in rural Appalachia were interviewed in depth and one-third of the population reported having no health insurance (Hatcher et al.). Thirty-three percent of the population reported not having a pap test in more than 5 years and 1% of the population never had a pap test (Hatcher et al.). The predisposing factors that were identified to be significantly associated with cervical cancer screening included the belief that cervical cancer has symptoms and that the women who were not screened felt too good to be screened (Hatcher et al.). Factors associated with women who were rarely or never screened included a high school education or less, and part time or no employment (Hatcher et al.). Health insurance status was not significantly associated with cervical cancer screening status (Hatcher et al.). Limitations of this study were a sample taken from only one single region in the United States that were mostly Caucasian and included only women who had not had a pap test; therefore, not allowing for a comparison group (Hatcher et al.). The results of this study cannot be generalized to women outside of rural Appalachia and suspicion of interviewer and respondent bias is a concern due to interviews being conducted (Hatcher et al.).

My study was needed because its results may be more generalizable in order to target the U.S. cervical cancer patient population. There is also a gap in the literature examining women residing in the United States with late stage cervical cancer diagnosis and their country of birth. Identifying any disparities that exist in the country of birth variable could further clarify factors associated with late stage cervical cancer diagnosis as well as help to develop new novel screening programs and/or further tailor and refine existing programs.

Problem Statement

Although numerous studies have shown a relationship between late stage cervical cancer and the type of health insurances (Fedewa et al., 2012; Polednak, 2003), these studies were done using a different patient population. This study will examine the SEER database which captures cancer data from over 28% of the United States population. Many studies have included insurance status as an independent variable while the main dependent variable was stage of cervical cancer at the time of diagnosis (Bradley et al., 2003; Fedewa et al. 2012). These studies did not include a nationally generalizable database that examined rural and urban populations together. The studies described education, socioeconomic status, ethnic and racial disparities in regards to stage of disease at diagnosis, access to screening, and survival times; there was no decisive evidence describing the impact insurance status has on the stage of disease at diagnosis in women across the United States residing in urban, suburban, and rural areas. Furthermore, there were no studies comparing women residing in the United States that were born in the United States with those women residing in the United States born outside of the United States as this study could accomplish.

Purpose of the Study

The purpose of this study was to conduct a retrospective cross sectional quantitative analysis to explore the factors associated with late Stage III or IV cervical cancer at diagnosis. The dependent variable is late stage cervical cancer diagnosis (Stage III or IV). The key independent variables for this study were insurance coverage, women's age at diagnosis, race/ethnicity, country of birth, and marital status. In particular, this study will contribute to the understanding of how insurance coverage and different types of insurance, along with country of birth, influence late stage cervical cancer diagnosis. Currently, the evidence linking late stage cervical cancer diagnosis with insurance types and country of birth are unclear using a national cancer database representative of the national population.

Research Questions and Hypotheses

RQ1: What is the association between late stage diagnosis of cervical cancer (Stage III and IV) and type of insurance coverage as compared to women with Stage I and II cervical cancer diagnosis?

$H_0$1: There is no association with late stage cervical cancer diagnosis (Stage III and IV) and type of insurance coverage as compared to women with Stage I and II cervical cancer diagnosis.

H_A1a: There is an association with late stage cervical cancer diagnosis (Stage III and IV) and type of insurance coverage compared to women with Stage I and II cervical cancer diagnosis.

RQ2: What other socio-demographic factors are associated with women with late stage diagnosis of cervical cancer (Stage III and IV) in the United States as compared to women with Stage I and II cervical cancer diagnosis?

$H_0$2: There is no association between socio-demographic factors and late stage cervical cancer diagnosis between women with late stage cervical cancer diagnosis (Stage III and IV) and women with Stage I and II cervical cancer diagnosis.

H_A2: There is a difference between socio-demographic factors and women with late stage cervical cancer diagnosis (Stage III and IV) as compared to women with Stage I and II cervical cancer diagnosis.

RQ3: What is the association between women with late stage diagnosis of cervical cancer (Stage III and IV) and country of birth as compared to women with earlier Stage I and II cervical cancer?

$H_0$3: There is no association with late stage cervical cancer diagnosis (Stage III and IV) and country of birth as compared to earlier stage cervical cancer (Stage I and II) and country of birth.

H_A3: There is an association with late stage cervical cancer diagnosis (Stage III and IV) and country of birth as compared to earlier stage cervical cancer (Stage I and II) and country of birth.

To answer the research questions an analysis was run to determine the relationship between the independent variables and the dependent variable after controlling for confounding factors. These results will be discussed in chapter 4 in detail.

Theoretical Framework

The theoretical framework used for this study was Andersen’s behavioral model of healthcare utilization (Andersen, 1995). Originally developed in the late 1960s, Andersen’s model was revised in 1995. Andersen′s model puts the focus on the family unit and the reasons for seeking out health care services.

Andersen’s model portrays many different factors that influence the use of health services and according to Andersen (1995) the model′s purpose was to examine and discover factors that facilitate or impede the utilization of health care services. Andersen′s theoretical framework relates to the study approach and research questions in this study because it examines factors that influence health and the use of health services. It is pertinent to this study because the predisposing factors and enabling resources may contribute to a late stage III or IV cervical cancer diagnosis. A more in-depth discussion will be included in Chapter 2.

Nature of the Study

This was a secondary data analysis of cross sectional data from the National Cancer Institute’s SEER. Data were collected via the SEER secondary database. Analyses were conducted using the EpiInfo 7 statistical application (CDC, 2013). Factors associated with late stage cervical cancer diagnosis (dependent variable) were examined. The key independent variables for this study were insurance coverage, country of birth, and three other factors that have been shown to be associated with a late stage diagnosis: women’s age at diagnosis, race/ethnicity, and marital status. Keeping the focus on the associations between stage of cervical cancer at diagnosis and these key variables, especially type of insurance coverage and country of birth, will help to elucidate the importance of women having good access to health care to improve their health outcomes survival.

Definitions

A data set from National Cancer Institute’s SEER was used for this analysis. As noted above, the variables examined included cervical cancer stage at diagnosis, age at diagnosis, race/ethnicity, marital status, and insurance coverage. The insurance variables are private insurance, Medicare, Medicaid, and no coverage.

Late stage: Late stage refers to any Stage III or IV cervical cancer diagnosis (American Joint Cancer Commission (AJCC), 2009).

1. *Private insurance*: This variable includes managed care plans, Health Maintenance Organization’s (HMO), Preferred Provider Organization (PPO’s), and fee for service plans. Medicaid includes state government administered insurance as well as Medicaid administered through a managed care plan, and Medicare includes those patients with and without a supplemental private insurance plan (SEER, 2007).

Socio-demographic variables: Include race/ethnicity:

2. Marital status is self-reported at the time of diagnosis; Single (never married), Married (including common law), Separated, Divorced, Widowed, Unmarried, Unknown. Age at

diagnosis is the age of the patient at the date the tumor was first diagnosed clinically or microscopically by a recognized medical practitioner. Birth country of origin includes United States and Other Country.

Cervical Cancer Staging

Cancer staging is a tool for the standardization of describing the disease and determining treatment and prognosis (American Joint Cancer Commission [AJCC], 2009). Cervical cancer is staged by the primary tumor size, regional lymph node involvement, and distant metastasis (AJCC, 2009). Staging systems are specific for cancers at certain anatomical sites. The AJCC system is a universally accepted staging system worldwide (AJCC, 2009).

The International Federation of Gynecology and Obstetrics (FIGO) developed a cancer staging system which is still widely used today and was updated in 2010 to stage cancers of the cervix, uterus, ovary, vagina, and vulva (AJCC, 2009). The FIGO staging system is based on the Tumor, Node, Metastasis (TNM) staging system information (AJCC, 2009).

The FIGO system has stages 0, I, II, III, and IV as well as subcategories designated with a letter such as A or B and a number such as 1 or 2. Specific to staging carcinoma of the cervix the categories are as follows:

- Stage IA1 is when the tumor is confined to the cervix with an invasion of < 3 mm with a lateral spread < 7mm.
- Stage IA2 is when the tumor is confined to the cervix with an invasion of > 3mm with less than a 7mm lateral spread.
- Stage IB1 is clinically visible and larger than IA2 but < 4 cm at its largest dimension.

- Stage IB2 is a clinically visible tumor > 4 cm at its largest diameter.
- Stage IIA1 involves the upper two-thirds of the vagina, without parametrial invasion, and is < 4 cm at its largest diameter.
- Stage IIA2 involves the upper two-thirds of the vagina and is > 4 cm at its largest diameter without parametrial involvement.
- Stage IIB involves the upper two-thirds of the vagina, is > 4 cm at its largest diameter and has parametrial involvement.
- Stage III cervical cancer there is regional lymph node metastasis.
- Stage IIIA the tumor extends into the lower third of the vagina.
- Stage IIIB the tumor invades the pelvic wall.
- Stage IV cervical cancer both IVA and IVB there is distant metastasis including peritoneal spread, involvement of supra-clavicular, mediastinal, or para-aortic lymph nodes, and spread to the bladder, lung, liver, or bone (AJCC, 2009).
- Late stage cervical cancer in this study was considered to be Stages III and IV by the FIGO. The corresponding TNM classification is T3, T3A, T3B and T4 (AJCC, 2009).

The TNM staging system was developed by the AJCC (AJCC, 2009) and is based upon the extent of the tumor (T), spread to the lymph nodes (N), and whether there is distant metastasis (M). The stages assigned in the TNM system are TX, T0, Tis, T1, T2, T3, and T4. TX is when the primary tumor cannot be evaluated. T0 is assigned when there is no evidence of a primary tumor. Tis designates an in situ carcinoma which indicates abnormal cells or precancerous cells are present and T1, T2, T3 and T4 correlate with the FIGO system stages I, II, III and IV (AJCC, 2009). The TNM system is generally not used to stage cervical cancer (AJCC, 2009).

Clinical staging occurs when the health care clinician evaluates information from the physical exam, blood tests, imaging tests, and pathology reports from the biopsies of the tumor or tumors to determine the extent of the cancer present and to estimate a prognosis based on evidence (AJCC, 2009). Pathologic staging occurs only if a patient undergoes an exploratory or cancer removal surgery. This staging is done by combining the results from the clinical staging along with the pathology and surgery reports with the intention of providing more precise information to inform treatment and to estimate the prognosis (AJCC, 2009). The restaging process is only done in cases where the cancer reoccurs in order to determine the extent of the disease during the relapse from remission (AJCC, 2009).

SEER uses an Extent of Disease (EOD) coding system that has five different fields incorporating 10 digits (SEER, n.d.). The digits incorporate the clinical, operative, and pathologic diagnosis of cancer (SEER, n.d.). The size of the recorded tumor is done while the patient is treatment naive or prior to any chemotherapy or radiation therapy (SEER, n.d.). The first three digits are for the size of the tumor and or its involvement, the next two digits for the extension of the tumor, and then one digit for indicating whether or not there is lymph node involvement (SEER, n.d.). After these six digits, there are two digits for the number of pathologically positive regional lymph nodes and two digits for the number of pathologically examined lymph nodes (SEER, n.d.).

Assumptions

This study examined insurance coverage as well as other demographic factors with the stage of cervical cancer at diagnosis; therefore, it is assumed that health insurance is an important factor in health. The secondary database that was used for this study was de-identified; therefore, individual records could not be reviewed to ensure accuracy of the data and it was assumed that the SEER database was somewhat representative of the national population**.** The SEER database includes individuals who reside in both rural and urban areas and pools them together. It should be noted that those who live in urban versus rural areas may have different enabling resources like having access to a greater number of hospitals, specialty clinics, and healthcare providers versus their rural counterparts. Individuals that live in rural areas may have to travel great distances with financial constraints and or have other hardships like no transportation system.

Scope and Delimitations

The specific aspects of the research problem that are addressed in this study are the factors that are associated with a late stage III or IV cervical cancer diagnosis. This specific focus was chosen to explore what factors such as insurance coverage, age at diagnosis, marital status, or race/ethnicity may be associated with women who are diagnosed at a late stage of the disease as compared to women diagnosed with Stage I and II cervical cancer. The population studied was women aged 18 and older with a Stage III or IV cervical cancer diagnosis from the SEER National Cancer Database compared to women aged 18 and older with Stage I and II cervical cancer diagnosis. Using the SEER data will contribute to the generalizability for women in the United States aged 18 and over with a cervix.

Strengths and Limitations

A strength of this study is that the cross sectional design provides an efficient way to evaluate a large sample of patients. An additional strength of this study was that it used a national cancer registry that included women residing in urban, suburban, and rural settings; therefore, being representative of the United States population.

The limitations of this study are that it was a snapshot in time, and therefore, causality should not be asserted. Exposure and outcome are simultaneously assessed in a cross sectional study; therefore, there is no temporal relationship described. It is also important to note that there is an inherent bias within this database. Not all cervical cancer diagnoses are reported to the SEER database. Data were collected from 26 states across the nation. Due to the nonexperimental study design and narrow time frame chosen, 2008 to 2012, results of this study will have limited generalizability.

Significance

Every year more than 11,000 women are diagnosed with cervical cancer in the United States (CDC, 2013). Treatment and prognosis are dependent on the stage of the disease at diagnosis (CDC, 2013). Approximately half of cervical cancers in the United States are diagnosed at a late stage of the disease (Henley, King, German, Richardson, & Plescia, 2010). Women who are diagnosed at a late stage of the disease are more likely to be black, over the age of 50, and to not have had a pap smear in the previous 5 years from diagnosis (American Cancer Society (ACS), 2009). Although there has been a decline in mortality from cervical cancer, it is still one of the top 10 diagnosed cancers in the United States in African American and Hispanic women and 13th for all other women (Henley et al., 2010). In 2010, African American women were more likely to die of cervical cancer than any other group (CDC, 2013). The death rate per

100,000 persons in the United States was 3.8 in African American women and 2.5 in Caucasian women (CDC, 2013). The high death rate for African Americans was thought to be because of a lack of access to treatment (Health Resources and Services Administration (HRSA), 2014).

Between the years 1990 and 2000, the United States experienced a 50% boom in the growth of foreign born populations (Schleicher, 2007). Women born outside of the United States are less likely to have good paying jobs as U.S. born women which may contribute to access to care and the ability to pay for insurance (Schleicher, 2007). Women that migrate to the United States often experience disease rates similar to those of their birth country, and they face many cultural barriers that may delay their access to preventative screening (Schleicher, 2007). The states with the highest number of foreign born populations are California, New York, Texas, Florida, New Jersey, and Illinois (Schleicher, 2007).

The results of this study will provide important information around women diagnosed with late staged cervical cancer (Stages III and IV) in comparison to women with Stage I and II cervical cancer across the nation. The country of birth was explored in association to late stage diagnosis as well as other factors associated with late stage diagnosis, such as age at diagnosis, race, ethnicity, and marital status. Insurance status as well as access to care using insurance coverage as a proxy, was examined to determine which factors play an important role in late stage diagnosis.

This research could contribute to a positive social change by identifying contributing factors to late stage diagnosis of cervical cancer in women across the nation residing in urban, suburban, and rural geographies. This study examined the late Stage III and IV group of women and compared them to the earlier stage I and II at diagnosis. This study also examined women born in the United States and compared them to foreign born women with late stage III and IV diagnosis. The results of this study may encourage the development of innovative cervical cancer prevention and health promotion programs aimed at specific populations with resources like personalized letters that are culturally appropriate or other innovations allowing for early detection of cervical cancer in women all across the United States and not just in a specific state or selective urban area. This study's potential contributions to advance knowledge in this discipline are the identification of factors that have an effect on women that are diagnosed with late stage cervical cancer across the United States. If these factors can be identified, then preventative measures and screening programs can be developed and put into action to target the population of women identified to be at high risk of being diagnosed with late stage cervical cancer as compared to those women who are diagnosed with earlier stage I and II cervical cancer.

Summary

Cervical cancer outcomes could be improved and disparities mitigated according to the NIH (1996). The 5 year survival rate is 91.2% for women diagnosed in an early stage of the disease (Stage I or II) and 17.0% for women diagnosed in the late stages of the disease (Stage III or IV; NIH, 1996). Although there is evidence supporting the correlation of insurance status and late stage diagnosis of cervical cancer in women, there is a gap in knowledge surrounding the types of insurance and their correlation to late stage diagnosis from a national cancer database that represents women nationally. Many of the studies that provide evidence supporting the link between late stage cervical cancer diagnosis and insurance examined only Medicaid and or Medicare and those women not insured that resided in a single state or in selective urban areas of the United States. Other studies that looked at insurance coverage only looked at data from COC accredited facilities as discussed in the literature review. Therefore, insurance coverage factors that influence women being diagnosed with cervical cancer at a late stage of the disease across the nation and not just by examining certain states and COC accredited facilities need to be identified and addressed in order to improve the outcomes of this disease in the nation as a whole. There were no studies in the literature examining country of birth and its association with late stage diagnosis.

Chapter 2: Literature Review

Introduction

Despite advances in knowledge and evidence regarding the reduction of risk factors associated with disparities in the early detection and successful treatment of cervical cancer, health disparities still exist (Jemal et al., 2004). Having private insurance has been associated with increased screening rates and a decrease in the odds of late stage diagnosis (Ferrante, Gonzalez, Roetzheim, Pal, & Woodard, 2000). This study examined factors associated with late stage cervical cancer diagnosis and type of health insurance coverage. There is a gap in knowledge regarding type of insurance coverage and its association with late stage diagnosis of cervical cancer in women across the United States. There is also a gap in knowledge regarding country of birth and its association with late stage diagnosis. Using data from a national cancer database that includes facilities from multiple states across the nation, including women who reside in suburban and rural areas, will strengthen this study's generalizability versus studies that have been done examining a single state's registry or only COC accredited facilities. The information gathered from this study will be helpful for public health practitioners and other health care providers to plan cervical health screening programs, as well as cervical cancer prevention programs, while being able to target high risk populations' representative of the population in the National Cancer Database.

Every year more than 11,000 women are diagnosed with cervical cancer in the United States CDC, 2013). Treatment and prognosis are dependent on the stage of the disease at diagnosis (CDC, 2013). Approximately half of cervical cancers in the United States are diagnosed at a late stage of the disease which is considered in this study to be Stage III or IV by

FIGO. The corresponding TNM classification is T3, T3A, T3B and T4 (AJCC, 2009; Henley, King, German, Richardson, & Plescia, 2010).

This chapter begins with a brief summary of factors associated with health disparities among the various segments of the U.S. population. According to the ACS (2012), health disparities account for unequal or no access to health care and preventative services. The National Comprehensive Cancer Network's (NCCN; 2014) standard of cancer care is discussed. Staging of cervical cancer was discussed in the previous chapter. This study was concerned with late stage cancer diagnosis. The theoretical framework of this study was based on Andersen's (1995) behavioral model of healthcare utilization. Andersen's model will be briefly discussed. Finally, this chapter contains a review of the existing relevant literature on the topic of late stage cervical cancer diagnosis and disparities and factors to consider, as well as the scientific evidence that was used as the information base for this study.

Literature Search Strategy

The majority of the literature referenced in this chapter was identified using electronic database searches that included PubMed, Academic Search Premier, CINAHL Plus, OVID, Mobile Library by Infotrieve, and EBSCO. The literature search was focused on articles published between the years 2004-2014 with older articles cited being relevant to this topic. Types of literature include peer-reviewed journal articles as well as seminal literature. The following key words and phrases were used for searches: *late stage cervical cancer, cancer cervix, cervical cancer and insurance, cancer and health disparities, disparities and health care access, late stage cancer,* and *insurance status.* In addition to using key word and phrase searches, the reference lists from research articles obtained were reviewed, and relevant articles were pulled and read for relevant information. Dissertations at Walden were also searched and no dissertations relevant to this topic were found. Peer-reviewed journal articles were also limited in number on this topic.

Theoretical Foundation

The theoretical framework for this study is Andersen’s behavioral model of healthcare utilization (Andersen, 1995). Originally developed in the late 1960s, Andersen’s (1995) model focused on the family unit and the reasons for seeking out health care services. In 1995, Andersen revised the model to focus on individuals instead of family units.

Andersen’s model provides the framework for an explanatory process of the many factors that influence the use of healthcare services (Andersen, 1995). Factors such as age and gender represent predisposing factors that suggest that individuals will need health services at some point in their lifetime (Andersen, 1995). Insurance coverage is considered an enabling resource because it increases the likelihood that utilization of health services will take place (Andersen, 1995). The health care system that an individual has access to is an environmental factor and may affect the use of health care services as well as outcomes in care (Andersen, 1995).

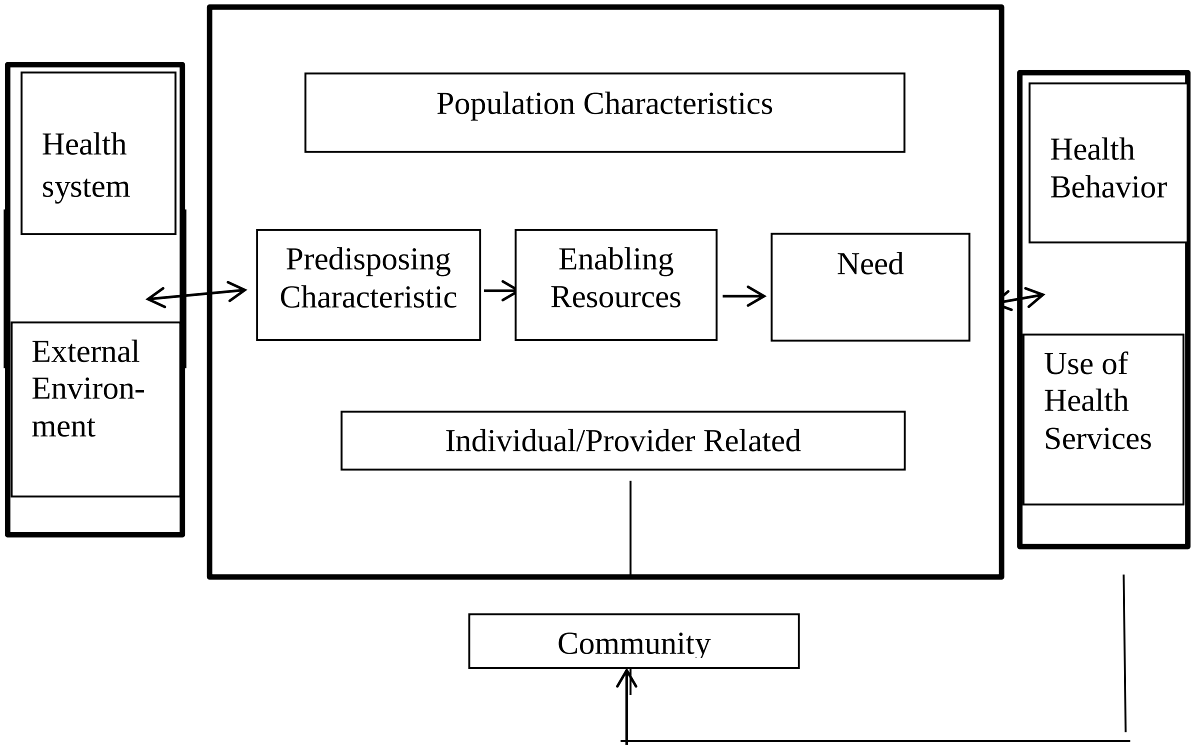

Figure 1. The Anderson model of health care utilization. Adapted from "Revisiting the Behavioral Model and Access to Medical Care: Does It Matter?" by R. M. Andersen, 1995, *Journal of Health and Social Behavior, 36,* pp. 1-10.

Andersen's (1995) model was chosen because it addresses the many influences on an individual and how they may impact an individual's access to care or how an individual makes a choice to seek out healthcare. As you can see in Figure 1, there are many external factors influencing an individual which affects their internal personal health choices. The predisposing factors explored by me in this study regarding a late stage diagnosis of cervical cancer are age at diagnosis, race/ethnicity, country of birth, and marital status. The enabling resource that was explored was health insurance coverage.

Health Disparities

Healthy People is a U.S. program that develops and tracks national health objectives for the nation (Brown et al., 2014). Between 2008 and 2010, the cervical cancer rate declined slightly but was still below the target set for Healthy People 2010 (Brown et al., 2014). The Healthy People 2020 target for cervical cancer was to have 2.2 deaths per 100,000 women, which is a 10% improvement from 2.4 deaths per 100,000 women in 2010 (Brown et al., 2014). Meeting the Healthy People target may prove to be difficult for subpopulations with low income, no health insurance, and lack of access to a continuous care source (Brown et al., 2014).

According to the ACS (2012), cancer is not evenly distributed throughout the population. There are populations with higher rates of cancer health disparities (ACS, 2012). Many populations that shoulder the burden of increased cancer rates are of minority races and ethnicities, low income, and have a low education level (ACS, 2012). Populations without health insurance get screened for cancer at half the rate the insured population gets screened (ACS, 2012). The fact that cervical cancer can be easily and inexpensively detected as well as effectively treated when the disease is caught early has provided the impetus for the National Cancer Institute (NCI) to postulate that a high rate of cervical cancer may be a red flag indicating a larger problem with the health care system (Freeman & Wingrove, 2005).

According to the CDC, in 2010 the incidence rate of cervical cancer in African American women was 11 per 100,000 and 10 per 100,000 in Hispanic women (CDC, 2013). Women who are diagnosed with a late stage (Stage III or IV) of cervical cancer are more likely to be African American, over 50 years of age, and to not have had a pap smear in the previous 5 years from their diagnosis (ACS, 2009). Although there has been a decline in mortality from cervical cancer, it is still one of the top 10 diagnosed cancers in the United States in African American and Hispanic women and 13th for all other women (Henley et al., 2010). In 2010, African American women were more likely to die of cervical cancer than any other group (CDC, 2013). The cervical cancer mortality death rate per 100,000 women in the United States is 4.2 in African American women and 1.8 per 100,000 in Caucasian women (CDC, 2013). The disproportionately high death rate for African Americans is thought to be because of a lack of access to treatment (Health Resources and Services Administration [HRSA], 2014). According to the ACS, Hispanic women shoulder the burden of the highest proportion of new cases of cervical cancer (ACS, 2012).

Early stage cervical cancer is considered to be Stage I and Stage II in this study. In Stage I, the cancer is contained to the cervix and in Stage II it involves the cervix and upper two-thirds of the vagina (AJCC, 2009). There is no spread to the lymph nodes or metastasis to other organs in Stage I or II (AJCC, 2009). When cervical cancer is found at an early stage , before it has spread, it is one of the most treatable cancers (ACS, 2004), and when cervical cancer is found at an early stage the 5-year survival rate increased to 91% (SEER, 2013). Research has demonstrated that women who are uninsured or have a lower socioeconomic status are at a survival disadvantage (Brookfield, Cheung, Lucci, Fleming, & Knoiaris, 2009). The American Cancer Society estimates that for all stages of cervical cancer combined, the 5-year relative survival for white women is 69% and 59% for black women. (ACS, 2012).

Kasper, Giovannini, and Hoffman (2000) found that individuals that had health insurance had better access to health care; Card, Dobkin, and Maestas (2004) found not having health insurance correlated with a negative impact on health that was cumulative over time. According to the ACS (2012), individuals that do not have health insurance are more likely to be diagnosed at a later stage of disease. Those individuals from medically underserved areas tend to be diagnosed at a later stage of the disease as well (NCI, 2008).

There are geographical disparities among women diagnosed with cervical cancer. Hispanic women living on the Texas border of Mexico have a higher mortality rate from cervical cancer, and there are higher mortality rates among Caucasian women in Appalachia, rural New York State, and northern New England (Coughlin et al., 2008). According to Miller, Kolonel, Bernstein, Young, and Swanson (1996), Vietnamese women have a five-fold higher rate of cervical cancer versus Caucasian women in the United States (NCI, 2008). Schleicher (2007) found that many times foreign born women experience disease at a rate similar to their country of birth and that certain areas of the United States have more foreign born residents than other areas. An example of this is that Mexicans make up the largest migrant group to the United States and reside in large populations in Texas and California which may contribute to the geographical disparities seen with cervical cancer rates (Schleicher, 2007).

Standard of Care for Cancer Patients

The NCCN (2014) is a nonprofit arbiter of high quality cancer care. The NCCN is comprised of an alliance of the top 25 cutting edge cancer centers in the world (NCCN, 2014). The NCCN has core values that include excellence, integrity, collaboration, passion, and innovation (NCCN, 2014). The NCCN develops clinical guidelines and resources to help clinical professionals deliver high quality care to their cancer patients (NCCN, 2014). Continuous quality improvement is an overarching goal of the organization in order to meet the mission of helping patients live quality lives (NCCN, 2014).

The experts affiliated with the NCCN (2014) are involved in developing the highest quality care guidelines for cancer patients. These experts are renowned cancer experts from all over the world that deal with complex, aggressive, and rare cancers (NCCN, 2014). The experts are from multidisciplinary backgrounds and all bring their distinct expertise to the table (NCCN, 2014). The guidelines are built on evidence and expert opinion from clinical practice (NCCN, 2014). The guidelines clearly state what treatments and services should be provided at the various different stages of the disease (NCCN, 2014). The NCCN (2014) offers health care providers access to the expert opinions of these world renowned experts in order to improve the efficiency of cancer care.

Review of Relevant Epidemiological Studies

Individuals that do not have health insurance may have less access to care and therefore lack continuity of care and access to preventative cancer screening services (Ward, Fedewa, Cokkinedes and Virgo, 2010). Some studies focusing on cervical cancer demonstrated that women who enrolled in Medicaid near the time of their diagnosis were significantly more likely to be diagnosed with late-stage disease than were those who had been enrolled for months before their diagnosis.

Bradley, Given and Roberts (2003) conducted an analysis of a linked database including information from the 1996 and 1997 Michigan Cancer Registry and Medicaid enrollment files to compare early versus late cancer stage at diagnosis among Medicaid patients. Reviewed were 5,076 records of women diagnosed with cervical cancer during 1996-1997 and 1,125 (22%) women were identified to be covered by Medicaid. Findings demonstrated that women aged 25-29 years had the highest incidence rate (2.98/1,000) of cervical cancer versus other age groups, and those who enrolled in Medicaid after their cancer diagnosis had a two to three times more likelihood of having late stage disease than those who were enrolled for months prior to their diagnosis. This studies generalizability is restricted to women who reside in the state of Michigan. The strength of Bradley et al. (2003) study was that the patients were matched on all variables except name, address, and date of birth. However even though the patients were matched on a number of variables there still could be potential confounding factors and residual confounding although minimized based on the large sample size.

O'Malley, Shema, Clarke, Clarke, and Perkins (2006) examined a secondary data set from the California Cancer Registry– Medicaid linked file to identify all Californians diagnosed with invasive cervical cancer during 1996 through 1999 and their Medicaid enrollment status The objective of the study was to determine whether Medicaid recipients had a higher rate of late stage cervical cancer diagnosis versus non Medicaid recipients. Adjustments for age, race/ethnicity and socioeconomic factors were accomplished and the results indicated that women enrolled in Medicaid were 2.8 times more likely to be diagnosed with late stage cervical cancer versus non-Medicaid enrollees. Women of low socioeconomic status and older women (age 49-64) were especially at increased risk of being diagnosed with late stage disease. This study was a retrospective registry study examining 4,682 cases of cervical cancer as identified by the California Cancer Registry and these patients were matched with the California Medicaid enrollment data files. Due to the study being focused on Medicaid coverage and late stage cervical cancer diagnosis, women age 65 and older and 15 and younger were excluded (O'Malley et al., 2006). The limitation of this study was the inability of the reference group to be stratified by uninsured women and women who were insured but not enrolled in Medicaid. An issue that could arise by including uninsured women in the reference group would be a dilution of the odds ratio for late stage diagnosis in the Medicaid coverage group. This study is also only able to be generalized to the female population age 16 to 65 years that reside in the state of California.

Symonds, Bolger, Hole, Mao and Cooke (2000) conducted an experimental in vivo study in where women scheduled for radiation or hysterectomy had in vivo labeling of their tumor with a DNA precursor BrdUrd. Women who had later stage cervical cancer at diagnosis had more rapid proliferation of their tumors and a shorter tumor doubling time. The data suggests that the stage at diagnosis of cervical cancer is more dependent on the biological behavior of the tumor, as expressed by proliferation rates, rather than a delay in presentation due to socioeconomic factors.

Crawford, Davis, Siddiqui, De Caestecker, and Gillis, (2002) performed a retrospective population study of women in Scotland diagnosed with cervical cancer during the year 1996-1997. Included in the analysis were 703 cases of cervical cancer by FIGO stage. Although the authors did not elaborate on types of cervical cancer the results indicated that mortality and delay in diagnosis were inversely related and surprisingly a paradox surfaced that demonstrated a paradox where the women with the shortest delay had more aggressive disease and were more likely to die than women with longer delays in diagnosis. According to Martin (2011) in an editorial responding to Crawford et al. (2002) a recommendation for a specific inclusion of the parameter of “waiting time” needs to be included in any subsequent multivariate analysis using the Cox proportional hazards model. Martin believes this will avoid any possible confounding effect on other variables. In a separate study using this approach, “waiting time” was found to be a statistically significant independent prognostic factor ($p<0.0001$; Turner, Bakker, Sham, Shaw, and Leigh, 2002). However Turner et al. (2002) study looked at the late stage diagnosis of amyotrophic lateral sclerosis (ALS) and not cervical cancer. Crawford et al. study results are limited by only being able to be generalized to the female population in Scotland.

Kapoor, Battaglia, Isabelle, Hanchate, and Kalish, (2014) examined insurance reform in the state of Massachusetts and its impact on whether having stable insurance would be associated with a more timely diagnosis of breast and cervical cancers. There were 1,165 women identified with breast cancer screening abnormalities and 781 women with cervical cancer screening abnormalities in six community health centers. The results concluded that having Medicaid insurance or no insurance did not have an impact on the cervical cancer population; however it did have a significant effect on the breast cancer population. The authors, Kapoor, et al. concluded that stable health insurance coverage may help underserved women receive timely follow up to an abnormal cancer screening.

Ward, Fedewa, Cokkinedes, and Virgo (2010) examined the stage at diagnosis of eight different cancers and insurance status in 843,177 patients aged 55-74 years of age using a secondary data set from the National Cancer Database; a database maintained jointly by the ACS and the American College of Surgeons. For all eight cancer sites examined the uninsured and Medicaid populations had the highest risk of being diagnosed at a later stage; III or IV, versus an earlier stage of the disease. Ward et al., concluded that if adults without health insurance coverage are extended coverage through health care reform that is equal to or better than Medicare benefits; late stage diagnosis would likely decrease in populations with low or no coverage.

Simard, Fedewa, Ma, Siegel, and Jemal (2012) examined trends in the risk of late-stage cervical cancer diagnosis by race/ethnicity and insurance status using data from the National Cancer Data Base. Cervical cancer mortality data from 1993-2007 was obtained from the National Vital Statistics System administered by the CDC National Center for Health Statistics, for nonHispanic Caucasians, nonHispanic African Americans, and Hispanic women. These groups were the three largest racial/ethnic groups to provide stable cervical cancer rates. Education level was used as a marker for socioeconomic status. Twenty-six states were included in the analysis due to education level not being collected in the remaining states. These twenty-six states in the analysis represented 42% of cervical cancer deaths among women ages 25 to 64 years in the United States. The results indicated the risk of late-stage diagnosis increased for uninsured women versus privately insured women over time. A calculation was done examining how many deaths from cervical cancer would have been averted in 2007 if socioeconomic status disparities were eliminated. According to Simard et al. (2012) 74% of cervical cancer deaths in the United States could have been prevented by eliminating socioeconomic disparities. Although the large sample size used by Simard et al. was a strength of the study, there were limitations. The National Cancer Database (NCDB) is hospital based and collects data from COC accredited facilities only. Therefore the results may not be generalizable to patients seen outside of a COC facility. The NCDB also has no formal validation of insurance status and during the study there was a change in coding of diagnosis from ICD 9 to ICD 10.

Brookfield, Cheung, Lucci, Fleming, and Koniaris (2009) analyzed a merged data set from the Florida Cancer Data System and Agency for Health Care Administration from the years 1998-2003 in order to understand late stage cervical cancer presentation and the disparities associated with it. Identified with invasive cervical cancer were 5,375 Florida residents. The results demonstrated insurance status as being an independent predictor of late presentation, as well as tumor stage and tumor grade. Surprisingly the data did not support race, ethnicity and socioeconomic variables as independent risk factors for late stage cervical cancer diagnosis. However these variables did play a role in survival times. African American women were more likely to die from their disease even though Hispanic women presented with more invasive disease than African American women. Poverty significantly decreased survival time across all ages and races. Women living in communities that had >15% of the population living in poverty had significantly decreased survival time compared with women living in communities with less poverty. Women who had Medicare coverage were 35% more likely to die during the study period, dual eligible' s with Medicare/Medicaid were 58% more likely to die versus women with private insurance during the study period ($P < .001$). This was a unique study due to including a diverse population with all their co- morbidities and the inclusion of all age groups. The sample size was large which contributes to the strength of the study. However there were limitations of the study. Misclassification of patients socioeconomic status (SES) may have occurred due to area based poverty levels by postal code being used for a proxy for SES and the generalizability is to women who reside in Florida.

In 2008 Clegg, Reichman, Miller, Hankey, and, Singh (2009) analyzed over 15,357 matched cases of late stage diagnosed cancer from the SEER-NLMS merged data to examine the stage at diagnosis with socioeconomic status. The National Longitudinal Mortality Study (NLMS) data provided self-reported, detailed demographic and socioeconomic data from the Social and Economic Supplement to the Census Bureau's Current Population. In 1999 the NCI linked the SEER data with the NLMS data. The findings from this study identified that women with less than a high school education had an increased odds ratio risk of 3.25 in developing cervical cancer versus those with a higher level of education. Women who lived at or below the poverty rate had an increased rate of cervical cancer from 3.35 to 4.30 and more nonHispanic African American women had late stage cervical cancer diagnoses versus other race/ethnicities. Although the strength of this study was the sample size, there were some study limitations. These included an underestimation of cervical cancer incidence if a control patient moved to a different nonSEER area and developed cancer and Clegg, et al. point out that caution should be used when using SES as a marker due to it not being representative over the life course versus nearer to cancer diagnosis.

Hatcher, Studts, Dignan, Turner, and Schoenberg (2011) conducted interviews with women who were rarely or never screened for cervical cancer to identify the predominant barriers to papinocular smear (pap) testing. A total of 345 women with a mean age of 51 living rurally in Appalachia were interviewed in depth and one third of the population reported having no health insurance. Thirty-three percent of the population reported not having a pap test in more than 5 years and 1% of the population never had a pap test. The predisposing factors that were identified to be significantly associated with cervical cancer screening included the belief that cervical cancer has symptoms and that the women who were not screened felt too good to be screened. Factors associated with women who were rarely or never screened included a high school education or less, and part time or no employment. Health insurance status was not significantly associated with cervical cancer screening status. Limitations of this study were a sample taken from only one single region in the United States that were mostly Caucasian and included only women who had not had a pap test; therefore not allowing for a comparison group. Interviews were conducted in this study therefore interviewer and respondent as well as information bias is a concern.

Nelson, Geiger, and Mangione (2002) conducted a retrospective cohort study of 733 predominantly Hispanic women aged 18 years and over who had a pap smear done at Kaiser Permanente in Los Angeles, CA during the years 1998-1999. Sixty-two percent of the sample delayed their care after receiving results of an abnormal pap smear. Health care beliefs responsible for this delay included individuals feeling that if they did not having abnormal bleeding there was no need to be seen; and if they had no symptoms this was a significant contributor to the delay in care. Race, ethnicity, education, and income were found not to be significant factors involved in the women who delayed care. Insurance status was not evaluated in this study due to all the women having Kaiser Insurance. This study is limited by not being able to make causal inferences regarding health beliefs and behaviors due to the self-administered survey taking place after the patient knew of their cancer diagnosis. Surveys were returned by mail and therefore may have been biased in that low literacy groups may have not returned questionnaires.

Redaniel, Laudico, Mirasol-Lumague, Gondos, and Uy, (2009) analyzed SEER data comparing Filipino Americans with Caucasian Americans and their FIGO stage at the time of cervical cancer diagnosis. For women less than 40 years of age, the proportion of Filipino Americans diagnosed with Stage IV disease were twice that of Caucasian women (5.19% versus 2.39%). In direct contrast Caucasian women aged 60 and over were diagnosed more often with Stage IV disease as compared with Filipino American women (14.94% versus 7.64%). When controlled for age Caucasians had a slightly higher mortality rate versus Filipino Americans (RR, 1.22). Although this study had a large sample size of 14,500 patients, it was not without limitation. A study limitation was that various prognostic factors were not examined such as socioeconomic status, access to screening services, co morbidities and immigration status. Strengths of the study included age adjustments which were accomplished to compare cancer survival estimates between the two cancer populations, and Cox proportional hazards model was used to assess factors that could potentially explain the mortality differences between the two populations. The age at diagnosis was accomplished by using the same age category stratification that was used in the age adjustment. No assumptions were violated when using the Cox models.

Polednak (2003) used a public SEER database including data from the Connecticut Tumor Registry to examine the trend in late stage diagnosis incidence rates for breast and cervical cancer. The objective of the study was to determine if there was an impact on the late stage incidence of cervical and breast cancer with the utilization of a statewide screening program launched in late 1995 targeting lower income and uninsured women. The results demonstrated that African American women from all age groups benefited from a decline in the late stage diagnosis of cervical cancer, however only African American women aged 65 and over benefited from a decline in breast cancer late stage incidence. Limitations of this study include errors in the calculation of age standardized incidence rates (ASIRs) in the denominators of women with late stage cervical and breast cancer. The calculations were projected due to being in between census counts. Another limitation of the study is that when a public health program is being evaluated it may take many years to determine an impact on late stage ASIRs. Any concerns regarding coding errors should have been minimal due to the utilization of SEER codes that have been used since 1988 and have constantly been subjected to quality control efforts. Also the results can only be generalized to women in the state of Connecticut.

Fedewa, Cokkinides, Virgo, Bandi, and Saslow, (2012) examined data on 69739 cervical cancer patients aged 21-85 years from the NCI. The objective of the study was to examine the relationship of insurance status and age with the stage of cervical cancer at diagnosis. Adjustments were made for race/ethnicity and socioeconomic factors. Results yielded evidence for a positive relationship with the proportion of late-stage disease increasing with age from 16.53% (21-34 years) to 42.44% (>/= 70 years). Advanced-stage disease among women aged 50 years and older had a risk that was 2.2 to 2.5 times that of patients aged 21 to 34 years. Uninsured women had a risk of RR = 1.44 of being diagnosed with late stage disease; Women covered by Medicaid had a RR of 1.37 and younger Medicare recipients ha a RR of 1.12 versus older Medicare recipients having a RR of 1.20. Medicare recipients overall had a higher risk of being diagnosed with late stage disease versus privately insured women. A limitation of the Fedewa et al. study is that data examined was collected by the COC facilities and therefore most of the cases resided in selective large urban areas. According to Bilimoria, Bentrem, Stewart, Winchester, and Ko, (2009) COC accredited facilities are located in large urban areas due to their size and are much larger than the smaller nonaccredited COC accredited COC facilities.

Halpern, Ward, Pavluck, Schrag, and Bian, (2008) examined insurance status and ethnicity with late stage cancer diagnoses at 12 body sites which included the cervical cancer site. Examined were 3,742,407 cases of cancer using a retrospective cross sectional approach using data from the United States National Cancer Database (NCD) from 1998 to 2004. The results indicated that patients at the highest risk of being diagnosed with late stage disease were more likely to have no insurance or Medicaid versus those patients with private insurance.

Summary and Conclusions

The methods used by the majority of the researchers in this review were mostly analyses of secondary data sets from large national databases and merged national databases like SEER, SEER-NLMS, NCD, and Agency for Healthcare Administration Database. Large national databases allow for adequate sample sizes but may not collect variables such as insurance type or status (Halpern, 2008). State cancer registries were also queried such as Florida Cancer Data System (Brookfield et al., 2009), California State Registry (O'Malley et al., 2006), Connecticut Tumor Registry (Polednak, 2003), Michigan Cancer Registry (Bradley et al., 2003), Massachusetts state registry (Kapoor et al., 2014) and multiple state Medicaid registries. In one study, a large health system database was used in the state of California, Kaiser Permanente Los Angeles data (Nelson et al., 2002). In one study, primary data was gathered on 345 women and analyzed (Hatcher et al., 2011).

The researchers investigated stage of cervical cancer diagnosis and the correlation between race/ethnicity, socioeconomic status, education level, age, mortality, delays in care, insurance status, and in one study the biological behavior of the tumor was investigated versus socioeconomic status (Symonds et al., 2000).

Many of the studies in this review included insurance status as an independent variable while the main dependent variable was stage of disease at cervical cancer diagnosis. The studies described education, socioeconomic status, ethnic and racial disparities in regards to stage of disease at diagnosis, access to screening, and survival times; there was no decisive evidence describing the impact insurance status has on the stage of disease at diagnosis in women across the United States.

The literature review demonstrates that significant disparities exist in cervical cancer care and that education level, socioeconomic status, race, ethnicity, and insurance status played a significant role in these disparities. The literature search findings were not robust with information regarding insurance status and stage of cervical cancer disease at diagnosis. The purpose of this retrospective cross-sectional observational study is to examine the insurance type, country of birth of women in the SEER database with Stage III and IV cervical cancer at diagnosis, and other socio-demographic factors including race, marital status, age at diagnosis and their association with late stage diagnosis.

Chapter 3: Research Method

Introduction

This chapter will describe the quantitative, observational, retrospective research design used in this study. This study examined factors associated with late stage cervical cancer diagnosis and type of health insurance coverage, race, marital status, age at diagnosis, and country of birth. The purpose of this study, as stated in Chapter 1, was to conduct a retrospective, cross-sectional quantitative study to explore factors associated with late stage III or IV cervical cancer at diagnosis as compared to women with an earlier stage I and II cervical cancer diagnosis. The dependent variable was late stage cervical cancer diagnosis (Stage III or IV). The key independent variables for this study were insurance coverage, women's age at diagnosis, race/ethnicity, marital status, and country of birth.

Published studies completed to date have examined insurance coverage and late stage cervical cancer diagnosis using a single state registry or COC registry representing one state's population or selective large urban populations (Fedewa et al., 2012). This study used the SEER database which may be more representative of the national population. The results of this study will provide important information around women diagnosed with later staged cervical cancer and their access to care using insurance coverage as a proxy compared to women with Stage I and II cervical cancer diagnosis.

This research will contribute to positive social change by identifying contributing factors such as insurance type, race, age at diagnosis, marital status, and country of birth, along with their association with late stage diagnosis (III and IV) of cervical cancer in women across the nation residing in urban, suburban, and rural geographies as compared to women with early stage cervical cancer (I and II). This study identified the association between late stage diagnosis of cervical cancer (Stage III and IV) and type of insurance coverage as compared to women with Stage I and II cervical cancer diagnosis. This study also identified the association between late stage cervical cancer diagnosis and country of birth as well as what other socio-demographic factors are associated with women with late stage diagnosis in the United States as compared to women with Stage I and II cervical cancer diagnosis.

The results of this study may encourage the development of innovative and culturally sensitive cervical cancer prevention and health promotion programs aimed at screening and early detection of cervical cancer across the United States.

Although past studies have examined the correlation between insurance coverage and late stage cervical cancer (Fedewa et al., 2012), there are few if any that have studied this correlation using a national cancer data base that has not been limited to COC facilities. There also have been studies examining late stage cervical cancer diagnoses and insurance coverage using state based data registries as well; however, these studies results may not be able to be generalized to the national population due to the data being from one state alone (Fedewa et al., 2012). This study uses the SEER national cancer database which collects cancer statistics nationally from sources that are not just from COC accredited facilities throughout the United States. SEER also includes rural areas and the American Indian reservations. To support the validity of the data in this study, SEER has a centralized data system which helps to keep the data collected consistent and of high quality (SEER, 2014).

This chapter begins with the research study design and rationale. The methodology using archival data which includes the procedure for gaining access to the dataset will also be discussed. This chapter will also describe the operationalization for each variable, the data analysis plan, threats to validity, and finally, this chapter concludes by addressing any confidentiality and ethical issues encountered.

Research Design and Rationale

This is an observational retrospective study of the SEER database. The late stage cervical cancer diagnoses in this study had already occurred in the past. The data used in this study is from the years 2010 and 2011 and is de-identified with no identifiers to any patient's names or records.

The primary variables used in this study include one dependent variable and three independent variables. The dependent variable is the late stage diagnosis (Stage III or IV) of cervical cancer and the independent variables are the type of insurance coverage at diagnosis, country of birth, age at diagnosis, and marital status at diagnosis. Other socio-demographic, health information and related environmental factors are also considered to control confounders.

Nonparametric tests make no assumptions about the parameters of normal distribution, and therefore, are free of parameters (Norman & Streiner, 2000). According to Norman and Streiner (2000), nonparametric tests can examine whether there is a relationship between two variables and if there are any differences between two groups. The chi square test is a nonparametric test; however, it is based on a distribution (Norman & Streiner). Unlike the parametric tests, the chi square is based on an abnormal distribution; therefore, it is a "parametric nonparametric statistic" (Norman & Streiner, 2000, p. 204). This study uses the chi square test to test the hypotheses; therefore, the chi square test will serve as the primary analysis. Regression analysis is a parametric statistic and can be used to explain the relationship between variables

(Norman & Streiner). It is used when two variables are thought to have a linear relationship (Norman & Streiner). The variables are insurance type at diagnosis, age at diagnosis, race/ethnicity, and marital status. Therefore, the independent X variables should be able to explain or predict the value of the Y variable of late stage cervical cancer diagnosis. The following assumptions are made when using regression analysis. The sample is representative of the population, the distribution of Y scores have equal variability for each X score, the variables are normally distributed, and the X and Y relationship is linear. Logistic regression was used in this analysis to explain the impact of insurance coverage type, race/ethnicity, age, and marital status on late stage cervical cancer diagnosis.

Study Population and Sample Size

The target population in this study is women in the United States aged 18 years and over with early Stage I and II and late stage cervical cancer diagnosis (Stages III or IV) included in the SEER database. In order to determine the estimated sample size needed for this study, a power analysis was performed using OpenEpi, version 3.0, an online power calculator. Falsely accepting the null or failing to correctly reject the null hypothesis is a Type II error. A power of .80 sets the power at an 80% chance of correctly or incorrectly rejecting the null hypothesis. Three important parameters that are needed to determine statistical power include significance level, sample size, and effect size (Norman & Streiner, 2000). The significance level is tied to the Type I error, which occurs when the results fail to correctly reject the null hypothesis. The significance level could be decreased to lower a Type I error; however, then the power would be reduced and the Type II error increased making it difficult to determine a statistical effect (Norman & Streiner, 2000).

It is important to determine a proper sample size because a sample that is too small may lead to inaccurate results and not be representative of the population. In order to determine the sample size for this study, a sample size analysis was accomplished. The results produced the number of participants needed for the study based on power and effect size. The calculator module used was Sample Size for a Cross –Sectional Cohort.

The literature review has demonstrated that late stage diagnosis (Stage III and IV) of cervical cancer in the U.S. general population is approximately 50 % in the Medicaid population and is 52% and 42% in the non-Medicaid population (Fedewa et al., 2012). The exposure is Medicaid. Therefore, the percent of exposed with outcome was entered into the calculator as 52% and a value of 42% was entered for the percent unexposed with outcome. The information already prepopulated in the calculator included a two-sided significance level (1-alpha) of 95%, a power (1-beta) of 80%, ratio of sample size of unexposed/exposed of 1. The desired population for this study calculated is 772 by the Kelsey method, 770 according to the Fleiss method and 810 according to Fleiss with continuity correction (CC).

Table 1

Sample Size: X-Sectional, Cohort, & Randomized Clinical Trials

Two-sided significance level(1-alpha):	95
Power(1-beta, % chance of detecting):	80
Ratio of sample size, Unexposed/Exposed:	1
Percent of Unexposed with Outcome:	42
Percent of Exposed with Outcome:	52
Odds Ratio:	1.5
Risk/Prevalence Ratio:	1.2
Risk/Prevalence difference:	10

Sample	Kelsey	Fleiss	Fleiss with CC
Sample Size - Exposed	386	385	405
Sample Size-Nonexposed	386	385	405
Total sample size:	772	770	810

Note: continuity correction (CC). Results rounded up to the nearest integer. Adapted from Kelsey et al., Methods in Observational Epidemiology 2nd Edition, Table 12-15
Fleiss, Statistical Methods for Rates and Proportions, formulas 3.18 &3.19

Data Methods

The dataset used in this study is archival data from the SEER dataset. Permission was obtained from SEER to access the data on March 4, 2014 in writing after I signed a data use agreement. I was given a username and password to sign in and download a relevant requested dataset for this study. I have submitted the paperwork for IRB approval from Walden University to access the dataset. After IRB approval I will download the relevant dataset then transfer it to an excel spreadsheet and categorize it for analysis using EpiInfo 7.0. The SEER dataset is publicly available and the data is de-identified with no links or identification to any patient names or records. The de-identified data will be stored on my computer at my residence and is password protected.

Operationalization of the Variables

There are four primary independent variables and 1 dependent variable examined in this study. The late stage cervical cancer diagnosis (stage III and IV) is the dependent variable and type of insurance coverage, country of birth, race/ethnicity, age at diagnosis, and marital status are the main independent variables. Also, this study will address and control confounding effects of other variables that affect relationship between independent and dependent variables.

Confounding variables that need to be considered as limiting factors if the data is not available or corrected for if the data is available include; long term contraceptive use which has been found to increase the risk of cervical cancer (Beral, et al., 1999); and a positive human papilloma virus (HPV) DNA which has been found to increase the risk of cervical cancer (Spinillo, et al., 2014). A positive HPV DNA combined with long term contraceptive use has been found to increase the risk of contracting invasive cervical cancer four-fold versus women negative for HPV DNA that did not have long term contraceptive use (Moreno, et al., 2002). Behavioral risk factors that need to be considered as confounding variables include at what age the patient had their first intercourse, and how many different sex partners they have had (Herbert & Coffin, 2008). Lower socio-economic status is also a confounding factor to late stage cervical cancer diagnosis (Clegg, et al., 2009) and smoking has been found to increase the risk of cervical cancer as well (Lindstrom & Hellberg, 2014) therefore smoking needs to be treated as a confounding variable.

The definitions for the variables and how they are measured are as follows:

> *Late-stage* cervical cancer diagnosis is defined as a stage III or IV by the International Federation of Gynecology and Obstetrics (FIGO). The corresponding TNM classification is T3, T3A, T3B and T4 (AJCC, 2009). Stage III and stage IV will be pooled together in this study for analysis.

Insurance coverage is defined as the type of insurance; Medicaid, private or uninsured; the subject had at diagnosis of late stage cervical cancer disease.

Race/Ethnicity is defined as Caucasian, African American, Hispanic, and other.

Age at diagnosis is defined as the age of the subject when the FIGO stage III or IV cervical cancer diagnosis was documented. The age categories are 20-29 years, 30-39 years, 40-49 years, 50-59 years, 60-69 years, 70-79 years and 80 years and older.

Marital status refers to single, married, separated, divorced, and widowed at the time of diagnosis of FIGO stage III or IV cervical cancer diagnosis.

Country of birth refers to those women born in the United States and those born outside of the United States residing inside the United States.

Inclusion and Exclusion Criteria

Inclusion criterion for participants is as follows:

- Female ages 18 and over
- Diagnosis of FIGO stage I, II, III or IV cervical cancer

Exclusion criterion for participants is as follows:

- Recurrent cervical cancer diagnosis
- Any cervical cancer stage other than I, II, III or IV

Data Analysis Plan

To obtain access to the SEER datasets needed for analysis; a signed data use agreement had to be on file with SEER. This was accomplished on March 4, 2014 and data access was granted on March 4, 2014. The data agreement is for use of deidentified data stripped of any patient identifiers or any links to patient records. The SEER database is a publically available database. The data file was transferred into an excel spreadsheet and then categorized and transferred to EpiInfo 3.5.4 for analysis. The dataset file was electronically stored on a personal laptop computer and was password protected.

To address each hypothesis a three step analysis was performed. In step 1 a univariate analysis of each independent and dependent variable was run to assess if the data is stable for further analysis. Step 2 includes a bivariate analysis run on baseline socio-demographic characteristics to determine homogeneity within the predictor variables category. Finally step 3 analysis includes determining relationship between independent and dependent variables after controlling for confounding effects.

To answer research question number 1; What is the association between late stage diagnosis of cervical cancer (stage III & IV) and type of insurance coverage as compared to women with stage I and II cervical cancer diagnosis and insurance coverage; stage I and II were pooled together and stage III and IV cervical cancer diagnosis were pooled together, and insurance coverage types were stratified into Medicaid, private, and uninsured.

To answer research question number 2; what other socio-demographic factors are associated with late stage III and IV diagnosis of cervical cancer in the US versus earlier stage I and II cervical cancer diagnosis; early stage diagnosis I and II were pooled together and late stage diagnosis III and IV were pooled together and compared with the socio-demographic factors of age at diagnosis, race/ethnicity, and marital status using chi square analysis.

To answer research question 3; what is the association between women with late stage diagnosis of cervical cancer (stage III & IV) and country of birth as compared to women with earlier stage I and II cervical cancer; the country of birth variable was stratified into United States, Mexico, El Salvador, Philippines, Vietnam and other country. The research variables, measures and coding are described below in Table 2.

Table 2

Research variables, measures and coding

Variable	Variable Type	Measure	Name	Codes
Age at Diagnosis	Independent Categorical Number	Age in years	AgeDx	20-29 years 30-39 years 40-49 years 50-59 years 60-69 years 70-79 years 80 and over
Race/Ethnicity	Independent		Race	White =1 Black = 2 Hispanic = 3 other = 4
Marital Status	Independent		Marital	Single = 1 Married = 2 Separated = 3 Divorced = 4 Widowed = 5

(table continues)

Late Stage Diagnosis	Dependent Categorical	FIGO stage III or IV cervical cancer	Stagelate	Stage III = 3 Stage IV = 4
Insurance Coverage	Independent Categorical	Type of insurance	Ins	Uninsured = 0 Medicaid = 1 Insured = 2
Early Stage Diagnosis	Dependent Categorical	FIGO stage I or II cervical cancer	Stageearly	Stage I = 1 Stage II = 2
Country of Birth	Independent Categorical		Country	U.S. = 0 Mexico = 1 Philippines = 2 Vietnam = 3 Other =4

Threats to Validity

The population used in this study derives from a secondary dataset. Limitations include confounding variables like smoking status, number of sex partners, HIV and HPV status not being controlled for due to lack of data. Another limitation is the country of birth variable data were collected exclusively from death certificates.

Ethical Procedures

This study uses secondary data that was de-identified and extracted from SEER. Therefore there are no patient identifiers, records or protected health information that was collected. There were no risks of disclosure of confidential or private information due to the nature of this de-identified data set. Before securing this data set into my possession and analyzing it, I obtained Walden University Institutional Review Board approval: IRB approval number 09-10-15-

0053950. After acquiring the SEER data, a password protected file was created and securely saved on a personal computer. On completion of this study, after meeting University requirements, the SEER data file will be permanently deleted from the computer to avoid accidental breach of patient confidential information.

Summary

In summary this was a quantitative cross- sectional retrospective study design using a secondary de-identified data set from a national cancer registry. The method of inquiry was a quantitative analysis using both chi square and multiple logistic regression tests. Results are presented in chapter 4.

Chapter 4: Results

Introduction

The purpose of this study was to test whether cervical cancer patients differ in regards to their stage of cervical cancer at diagnosis based on their insurance status, country of birth, age, race/ethnicity, or marital status. Specifically, this study examined insurance coverage and whether or not coverage made a difference in the stage at diagnosis, as well as country of birth and whether or not that had an impact on the stage at diagnosis. Anderson’s (1995) behavioral model of healthcare utilization was used as a framework for this study and the AJCC cancer staging was used to determine stage at diagnosis.

This study examined the following research questions and tested the following hypotheses:

RQ1: What is the association between late stage diagnosis of cervical cancer (Stage III and IV) and type of insurance coverage as compared to women with Stage I and II cervical cancer diagnosis?

$H_0$1: There is no association with late stage cervical cancer diagnosis (Stage III and IV) and type of insurance coverage as compared to women with Stage I and II cervical cancer diagnosis.

H_A1: There is an association with late stage cervical cancer diagnosis (Stage III & IV) and type of insurance coverage compared to women with Stage I and II cervical cancer diagnosis.

RQ2: What other socio-demographic factors are associated with women with late stage diagnosis III and IV of cervical cancer in the United States as compared to women with Stage I and II cervical cancer diagnosis?

$H_0$2: There is no association between socio-demographic factors and late stage cervical cancer diagnosis between women with late stage III and IV cervical cancer diagnosis and women with Stage I and II cervical cancer diagnosis.

H_A2: There is a difference between socio-demographic factors and women with late stage III and IV cervical cancer diagnosis as compared to women with Stage I and II cervical cancer diagnosis.

RQ3: What is the association between women with late stage diagnosis of cervical cancer (Stage III and IV) and country of birth as compared to women with earlier Stage I and II cervical cancer?

$H_0$3o: There is no association with late stage cervical cancer diagnosis (Stage III and IV) and country of birth as compared to earlier stage cervical cancer (Stage I and II) and country of birth.

H_A3: There is an association with late stage cervical cancer diagnosis (Stage III and IV) and country of birth as compared to earlier stage cervical cancer (Stage I and II) and country of birth.

This chapter will present the data collection and the sample description followed by the study results and chapter summary.

Data Collection

The data were obtained from the SEER dataset and consisted of 7,445 deidentified records of female patients diagnosed with cervical cancer from the years 2008 through 2012. The data from SEER were received via the Internet from which I created an unformatted matrix by using the NCI, SEERStat statistical analyses program. The SEER version 19 research data covers 28% of the United States population, included the following geographic areas: Connecticut, Hawaii, Iowa, New Mexico, Kentucky, Louisiana, New Jersey, Atlanta (metropolitan), greater Georgia, Seattle, Detroit, San Francisco, Los Angeles, San Jose-Monterey, greater California, and Alaska Natives (NCI, 2012). After applying inclusion and exclusion criteria to the data set, the matrix yielded 7,445 records. The groups that were compared were the early stage group, which included all women diagnosed with AJCC Stage I and/or II cervical cancer, and the late stage group, which was comprised of women who were diagnosed with AJCC Stage III and/or IV cervical cancer.

The age at diagnosis categories in this study were set as follows: 20-29, 30-39, 40-49, 50-59, 60-69, 70-79, and 80 and over. The marital variable categories included married, single, separated/divorced, and widowed. The race category was Caucasian, African American, and Other. For the ethnicity category, Hispanic and non-Hispanic were used. The Hispanic category included Mexicans, Puerto Ricans, and Cubans.

The characteristics of the study sample are as follows: The frequency analysis for cervical cancer patients in each age category at the time of cervical cancer diagnosis demonstrated that the majority of the patients diagnosed with cervical cancer fall into the 40-49 age group (24.8%), followed by the 50-59 age group (22.6%). Out of a total of 7,445 patients, there were 345 (4.6%) patients in the 20-29 age group; 1,361(18.3%) in the 30-39 age group, 1,843 (24.8%) in the 40-49 group; 1,682(22.6%) in the 50-59 age group, 1,161 (15.6%) in the 60-69 age group, 663(8.9%) in the 70-79 age group, and 390 (5.2%) in the 80 and over age group. The majority of women, 5,274 (70.8%) were born in the United States versus 815 (10.9%) born in Mexico, 226 (3.0%) born in the Philippines, 147 (2.0%) born in El Salvador, 106 (1.4%) born in Vietnam, and 877 (11.8%) were born in countries other than those listed. The frequency of Hispanic women with a cervical cancer diagnosis was 1,904 (26.6%) versus 5,541 (74.4%) being nonHispanic. Out of 7,445 women 4,205 (56.5%) were insured, 2,629 (35.3%) had Medicaid, and 611 (8.2%) were uninsured at the time of their cervical cancer diagnosis. The majority of women were married 3,029 (40.8%), 2,395 (32.2%) were single, 1,126 (15.2%) were separated/divorced, and 879 (11.8%) were widowed. The majority of women were Caucasian 5,537 (74.4%), 1,126 (15.1%) were African American, and 782(10.5%) were categorized as other race. Most women were diagnosed with early stage disease 4,029 (51.1%) versus late stage disease 3,416 (45.9%).

Results

A single two way analysis was performed to determine if there was an association between the stage of cervical cancer at diagnosis (early stage I and II versus late stage III and IV) and independent variables (age at diagnosis, race, ethnicity, marital status, insurance coverage, and country of birth). The late stage group had a greater percentage of women than the early stage group for the 50-59, 60-69, 70-79, and 80 and over age groups ($p = 0.0000$). In the Caucasian group, there was a greater percentage in the early stage group (55.6%) than the late stage group (44.4%: $p = 0.0000$). In the African American group, the percentage in the late stage group (54.0%) was higher than the early stage group (46.0%; $p = 0.0000$). In the other race category, there was a higher percentage of women in the early stage group (55.6%) than in the late stage group (44.4%; $p = 0.0000$). In regards to ethnicity, the non-Hispanic group had a greater percentage (52.0%) than in the late stage group versus the early stage group (48.0%; $p = 0.0000$). In the marital category, the percentage of married women was higher in the early stage (59.4%) group than in the late stage group (40.6%; $p = 0.0000$) and the single women had a slightly higher percentage in the early stage group (52.8%) than the late stage group (47.2%; $p = 0.0000$). In the separated/divorced category, there was a higher percentage of women in the late stage group (50.4%) than the early stage group (49.6%) as well as the widowed women had a higher percentage in the late stage group (54.4%) than in the early stage group (45.6%; $p = 0.0000$). Regarding insurance, the *uninsured* group had a larger percentage in the late stage group (53.4%) than in the early stage group (46.6%). In the Medicaid group and in the insured group there was a larger percentage of women in the early stage group (50.8% and51.8%) than the late stage group (49.2% and 48.2%; $p = 0.0000$). In the country of birth category, women born in the United States had a greater percentage in the late stage group (51.8%) than the early stage group (48.2%; $p = 0.0000$). Mexico had a larger percentage in the early stage group (61.8%) than late stage group (38.2%; $p = 0.0000$) as did the Philippines born group with the early stage at 59.3% versus the late stage at 40.7%, the El Salvador born group with early stage at 63.3% versus late stage at 36.7%, the Vietnam born group the percentage of women with early stage (52.8%) was greater than late stage (47.2%) and other country born group with early stage at 58.2% versus late stage at 41.8% ($p = 0.0000$). The year of diagnosis was not statistically significant between the early and late stage groups ($p = 0.4997$).

Logistic Regression Model

Logistic regression analysis was used to test all three hypotheses and accept or reject the null. The full model with all the independent variables for the late stage group is shown in Table 5. The -2 Log Likelihood (LL) for this model is 9881.3699 and the *p* value for this model is statistically significant (*p* = 0.0000).

RQ1: What is the association between late stage diagnosis of cervical cancer (Stage III and IV) and type of insurance coverage as compared to women with Stage I and II cervical cancer diagnosis?

$H_0$1: There is no association with late stage cervical cancer diagnosis (Stage III and IV) and type of insurance coverage as compared to women with Stage I and II cervical cancer diagnosis.

H_A1: There is an association with late stage cervical cancer diagnosis (Stage III and IV) and type of insurance coverage compared to women with Stage I and II cervical cancer diagnosis.

There is a significant increase in risk of late stage diagnosis of cervical cancer in uninsured women (*OR* 1.78, *p* = 0.0000) and women insured by Medicaid (*OR* 1.50, *p* = 0.0000) versus insured women (see Table 5). Therefore the null hypothesis for Research Question 1 is rejected. There is an association with late stage cervical cancer diagnosis (Stage III and IV) and type of insurance coverage compared to women with Stage I and II cervical cancer diagnosis. Therefore the alternative hypothesis is accepted.

RQ2: What other socio-demographic factors are associated with women with late stage diagnosis III and IV of cervical cancer in the United States as compared to women with Stage I and II cervical cancer diagnosis?

$H_0$2: There is no association between socio-demographic factors and late stage cervical cancer diagnosis between women with late stage III and IV cervical cancer diagnosis and women with Stage I and II cervical cancer diagnosis.

H_A2: There is a difference between socio-demographic factors and women with late stage III and IV cervical cancer diagnosis as compared to women with Stage I and II cervical cancer diagnosis.

There is a significant risk for late stage cervical cancer diagnosis in older women $\geq$ 40 years versus the women in the younger age categories. There was no significant difference in risk between the women in the age categories of 20-29 and 30-39 (*OR* 1.14, p = 0.29). However women aged 40-49 were at increased risk of late stage diagnosis versus the 20-29 group (*OR* 1.60, *p* = 0.0002), the 50-59 group also had an increased risk (*OR* 2.45, *p* =0.0000), the 60-69 group was at increased risk (*OR* 2.48, *p* = 0.0000), the 70-79 group was at increased risk (*OR* 2.76, *p* = 0.0000), and finally the 80 and over group had an increased risk 3 times that of the 20-29 age group (*OR* 3.1, *p* = 0.0000) (Table 3). The null is rejected for the independent variable of age at diagnosis.

Women born outside of the United States had a lower risk of late stage diagnosis versus women born in the United States (*OR* 0.67, *p* = 0.0000). There was no significant difference in risk between African American and Caucasian women (*OR* 1.15, *p* = 0.053) and no significant difference between other race category and Caucasian women (*OR* 1.16, *p* = 0.13). There was no significant difference between Hispanic and nonHispanic women (*OR* 1.13, $p = 0.09$) (Table 3). Therefore the null is rejected for the independent variable of country of birth.

Women that were single had a significant risk of late stage diagnosis versus married women (*OR* 1.26, $p = 0.0001$), separated/divorced women also had a significant increase in risk versus their married counterparts (*OR* 1.21, $p = 0.008$). There was no significant difference in risk between the widowed women versus the married women (*OR* 1.17, $p = 0.07$) (Table 3). Therefore the null is rejected for the independent variable of marital status.

RQ3: What is the association between women with late stage diagnosis of cervical cancer (Stage III and IV) and country of birth as compared to women with earlier Stage I and II cervical cancer?

$H_0$1: There is no association with late stage cervical cancer diagnosis (Stage III and IV) and country of birth as compared to earlier stage cervical cancer (Stage I and II) and country of birth.

H_A1: There is an association with late stage cervical cancer diagnosis (Stage III and IV) and country of birth as compared to earlier stage cervical cancer (Stage I and II) and country of birth.

Overall there was a statistically significant lower risk of late stage diagnosis in women born outside of the United States than women born inside the United States (*OR* 0.67, $p = 0.0000$). Therefore the null hypothesis is rejected for the independent variable of country of birth. The alternative hypothesis of there is an association with late stage cervical cancer diagnosis (Stage III and IV) and country of birth as compared to earlier stage cervical cancer (Stage I and II) and country of birth, is accepted.

Table 3

Unconditional Logistic Regression for all Independent Variables (n=7,429)

Term	Odds Ratio	95%	C.I.	Coefficient	S. E.	Z-Statistic	P-Value
agedxcat (30-39/20-29)	1.1495	0.8903	1.4842	0.1393	0.1304	1.0686	0.2852
agedxcat (40-49/20-29)	1.5961	1.2447	2.0466	0.4676	0.1269	3.6857	0.0002
agedxcat (50-59/20-29)	2.4479	1.9035	3.1481	0.8952	0.1283	6.9574	0.0000
agedxcat (60-69/20-29)	2.4800	1.9063	3.2265	0.9083	0.1342	6.7655	0.0000
agedxcat (70-79/20-29)	2.7568	2.0651	3.6802	1.0141	0.1474	6.8796	0.0000
agedxcat (80 and over/20-29)	3.0530	2.2000	4.2366	1.1161	0.1672	6.6765	0.0000
USA (b.other/a. Yes)	0.6740	0.5826	0.7798	-0.3945	0.0743	-5.3065	0.0000
racecat (b. Black/a. White)	1.1476	0.9984	1.3191	0.1377	0.0711	1.9376	0.0527
racecat (c. Other/a. White)	1.1571	0.9571	1.3989	0.1459	0.0968	1.5074	0.1317

(table continues)

Term	Odds Ratio	95%	C.I.	Coefficient	S. E.	Z-Statistic	P-Value
maritalcat (b. Single/a. Married)	1.2568	1.1182	1.4125	0.2285	0.0596	3.8335	0.0001
maritalcat (c. Separated/ Divorced/a. Married)	1.2129	1.0510	1.3996	0.1930	0.0731	2.6412	0.0083
maritalcat (d. Widowed/a. Married)	1.1739	0.9847	1.3996	0.1604	0.0897	1.7876	0.0738
inscat (Medicaid/ /Insured)	1.4983	1.3441	1.6703	0.4043	0.0554	7.2944	0.0000
inscat (Uninsured / Insured)	1.7720	1.4781	2.1243	0.5721	0.0925	6.1829	0.0000
ethniccat (Non-Hispanic/Hispanic)	1.1326	0.9794	1.3098	0.1246	0.0742	1.6795	0.0931
YRDx	1.0275	0.9939	1.0623	0.0272	0.0170	1.6006	0.1095
CONSTANT	*	*	*	-6.8392	3.5648	-1.9185	0.0550
Convergence:		Converged		C			
Iterations:		5					
Final -2*Log-Likelihood		9881.3699					
Cases included:		7429					

Test	Statistic	D.F.	P-Value
Score	357.505	16	0.0000
Likelihood Ratio	366.108	16	0.0000

In the Medicaid subgroup (*n* = 2,629) there was a significant increase in risk in all the age categories except the 20-29 and 30-39 age groups (Table 6). There was less risk in the women born in Mexico (*OR* 0.61, *p* = 0.00), the Phillipines (*OR* 0.47, *p* = 0.01), Vietnam (*OR* 0.52, *p* = 0.05) and other country (*OR* 0.59, *p* = 0.00) versus being born in the United States.

Table 4

Unconditional Logistic Regression for all Independent Variables in Medicaid Group (n=2622)

Term	Odds Ratio	95%	C.I.	Coefficient	S. E.	Z-Statistic	P-Value
agedxcat (30-39/20-29)	1.3094	0.9029	1.8990	0.2696	0.1897	1.4215	0.1552
agedxcat (40-49/20-29)	1.7032	1.1867	2.4447	0.5325	0.1844	2.8882	0.0039
agedxcat (50-59/20-29)	2.7898	1.9256	4.0418	1.0260	0.1892	5.4239	0.0000
agedxcat (60-69/20-29)	2.3211	1.5461	3.4845	0.8420	0.2073	4.0619	0.0000
agedxcat (70-79/20-29)	2.4514	1.5211	3.9506	0.8967	0.2435	3.6827	0.0002
agedxcat (80 and over/20-29)	2.3925	1.3469	4.2497	0.8723	0.2931	2.9759	0.0029
country (b. Mexico/a.US)	0.6122	0.4581	0.8183	-0.4906	0.1480	-3.3141	0.0009
country (c.Phillipines /a.US)	0.4694	0.2579	0.8543	-0.7563	0.3055	-2.4755	0.0133
country (d.ElSalvador/a.US)	0.7243	0.4460	1.1762	-0.3225	0.2474	-1.3039	0.1923
country (e.Vietnam/a.US)	0.5235	0.2744	0.9989	-0.6472	0.3296	-1.9633	0.0496

(table continues)

Term	Odds Ratio	95%	C.I.	Coefficient	S. E.	Z-Statistic	P-Value
country (f.Other/a.US)	0.5937	0.4430	0.7958	-0.5213	0.1494	-3.4885	0.0005
racecat (b. Black/a. White)	1.1145	0.8782	1.4145	0.1084	0.1216	0.8918	0.3725
racecat (c. Other/a. White)	1.2940	0.8908	1.8798	0.2578	0.1905	1.3529	0.1761
Maritalcat (b. Single/a. Married)	1.2034	0.9906	1.4620	0.1852	0.0993	1.8649	0.0622
Maritalcat (c. Separated/Divorced/a. Married)	1.1415	0.8946	1.4566	0.1324	0.1243	1.0646	0.2871
Maritalcat (d. Widowed/a. Married)	1.0785	0.7821	1.4872	0.0756	0.1640	0.4609	0.6449
ethniccat (Non-Hispanic/Hispanic)	1.2288	0.9589	1.5747	0.2060	0.1266	1.6281	0.1035
YRDx	1.0106	0.9558	1.0685	0.0105	0.0284	0.3709	0.7107
CONSTANT	*	*	*	-2.9705	5.9767	-0.4970	0.6192
Convergence	converged						
Iterations:	4						
Final -2*Log-Likelihood:	3509.4636						
Cases included:	2622						

Test	Statistic	D.F.	P-Value
Score	122.1938	18	0.0000
Likelihood Ratio	124.6618	18	0.0000

In the insured group (*n* = 4,205) there was a significant increase in risk of late stage diagnosis in all the age groups except the 20-29 and 30-39 age groups. There was also a significant increase in late stage diagnosis risk in the single women group (*OR* 1.19, *p* = 0.03) versus the married group (Table 5). Conversely, there was a decreased risk of late stage diagnosis in the women born in Mexico versus born in the United States (*OR* 0.83, *p* = 0.00)

Table 5

Unconditional Logistic Regression for all Independent Variables in Insured Group (n=4197)

Term	Odds Ratio	95%	C.I.	Coefficient	S. E.	Z-Statistic	P-Value
agedxcat (30-39/20-29)	0.9536	0.6535	1.3916	-0.0475	0.1928	-0.2463	0.8054
agedxcat (40-49/20-29)	1.4563	1.0094	2.1012	0.3759	0.1870	2.0098	0.0444
agedxcat (50-59/20-29)	2.4241	1.6772	3.5035	0.8855	0.1879	4.7121	0.0000
agedxcat (60-69/20-29)	2.6102	1.7933	3.7991	0.9594	0.1915	5.0095	0.0000
agedxcat (70-79/20-29)	2.8214	1.8964	4.1977	1.0372	0.2027	5.1169	0.0000
agedxcat (80 and over/20-29)	3.3561	2.1684	5.1944	1.2108	0.2229	5.4330	0.0000
country (b. Mexico/a.US)	0.8345	0.5837	1.1930	-0.1810	0.1824	-0.9923	0.0009
country (c. Phillipines /a.US)	0.8163	0.5171	1.2886	-0.2029	0.2329	-0.8712	0.3836
country (d.ElSalvador /a.US)	0.6955	0.3333	1.4515	-0.3631	0.3754	-0.9674	0.3334

(table continues)

Term	Odds Ratio	95%	C.I.	Coefficient	S. E.	Z-Statistic	P-Value
country (d. Vietnam /a.US)	1.2850	0.6676	2.4730	0.2507	0.3341	0.7506	0.4529
country (d. Other /a.US)	0.8827	0.6949	1.1211	-0.1248	0.1220	-1.0228	0.3064
racecat (b. Black/a. White)	1.1737	0.9713	1.4182	0.1601	0.0965	1.6587	0.0972
racecat (c. Other/a. White)	1.0050	0.7450	1.3558	0.0050	0.1527	0.0329	0.9737
maritalcat (b. Single/a. Married)	1.1900	1.0111	1.4007	0.1740	0.0832	2.0923	0.0364
maritalcat (c. Separated/Divorced/a. Married)	1.1759	0.9703	1.4250	0.1620	0.0980	1.6527	0.0984
maritalcat (d. Widowed/a. Married)	1.1357	0.9107	1.4163	0.1272	0.1126	1.1296	0.2586
ethniccat (Non-Hispanic/Hispanic)	1.0073	0.8076	1.2564	0.0073	0.1127	0.0648	0.9483
YRDx	1.0339	0.9884	1.0815	0.0333	0.0230	1.4508	0.1468
CONSTANT	*	*	*	-8.0162	4.8214	-1.6626	0.0964
Convergence		Converged		C			
Iterations:		5					
Final -2*Log-Likelihood:		5519.494					
Cases included:		4197					
Test	Statistic	D.F.	P-Value				
Score	203.396	18	0.0000				
Likelihood Ratio	208.339	18	0.0000				

In the uninsured subgroup (*n* = 611) there was a significant increase in risk of late stage diagnosis in the single women versus married women (*OR* 1.58, *p* = 0.02). There was also a decrease in risk of late stage diagnosis in women born in El Salvador (*OR* 0.14, *p* = 0.00) and other country (*OR* 0.43, *p* = 0.00) versus being born in the United States (Table 6).

Table 6

Unconditional Logistic Regression for all Independent Variables in Uninsured Group (n=610)

Term	Odds Ratio	95%	C.I.	Co-efficient	S. E.	Z-Statistic	P-Value
agedxcat (30-39/20-29)	1.4261	0.4763	4.2697	0.3549	0.5595	0.6344	0.5258
agedxcat (40-49/20-29)	1.6867	0.5763	4.9366	0.5228	0.5479	0.9541	0.3400
agedxcat (50-59/20-29)	1.4582	0.4974	4.2744	0.3772	0.5487	0.6874	0.4918
agedxcat (60-69/20-29)	1.7039	0.5455	5.3220	0.5329	0.5811	0.9171	0.3591
agedxcat (70-79/20-29)	4.4855	0.8276	24.3111	1.5009	0.8623	1.7405	0.0818
agedxcat (80 and over/20-29)	0.9431	0.0948	9.3808	-0.0586	1.1721	-0.0500	0.9601
country (b. Mexico/a.US)	0.5400	0.2799	1.0418	-0.6162	0.3353	-1.8380	0.0661
country (c. Phillipines /a.US)	0.2728	0.0668	1.1138	-1.2988	0.7177	-1.8098	0.0703

(table continues)

Term	Odds Ratio	95%	C.I.	Co-efficient	S. E.	Z-Statistic	P-Value
country (d.ElSalvador /a.US)	0.1396	0.0399	0.4884	-1.9688	0.6389	-3.0816	0.0021
country (d. Vietnam /a.US)	0.0000	0.0000	1.0E1	-14.3515	258.80	-0.0555	0.9558
country (d. Other /a.US)	0.4313	0.2572	0.7233	-0.8410	0.2638	-3.1880	0.0014
racecat (b. Black/a. White)	0.9220	0.5861	1.4503	-0.0813	0.2311	-0.3516	0.7252
racecat (c. Other/a. White)	2.1411	0.7505	6.1087	0.7613	0.5349	1.4233	0.1546
maritalcat (b. Single/a. Married)	1.5823	1.0621	2.3573	0.4589	0.2034	2.2560	0.0241
maritalcat (c. Separated/Divorced/a. Married)	1.5192	0.8845	2.6093	0.4182	0.2760	1.5153	0.1297
maritalcat (d. Widowed/a. Married)	1.9346	0.9306	4.0220	0.6599	0.3734	1.7672	0.0772
ethniccat (Non-Hispanic/Hispanic)	1.2437	0.7115	2.1739	0.2181	0.2849	0.7653	0.4441
YRDx	1.0405	0.9236	1.1721	0.0397	0.0608	0.6530	0.5138
CONSTANT	*	*	*	-8.7539	12.771	-0.6854	0.4931
Convergence			Converged	C			
Iterations:			13				
Final -2*Log-Likelihood:			788.3077				
Cases included:			610				

(table continues)

Test	**Statistic**	**D.F.**	**P-Value**
Score	51.6274	18	0.0000
Likelihood Ratio	54.4378	18	0.0000

Women born in the United States (*n* =5,274) were at a significantly increased risk of late stage diagnosis if they were aged 40 and over, if they had medicaid or were uninsured; and also if they were single versus being married (Table 7)

Table 7

Unconditional Logistic Regression for all Independent Variables in US Birth Country Group (n=5261)

Term	Odds Ratio	95%	C.I.	Coefficient	S. E.	Z-Statistic	P-Value
agedxcat (30-39/20-29)	1.605	0.8724	1.5438	0.1489	0.1456	1.0227	0.3065
agedxcat (40-49/20-29)	1.6256	1.2317	2.1454	0.4859	0.1416	3.4319	0.0006
agedxcat (50-59/20-29)	2.4560	1.8537	3.2539	0.8985	0.1435	6.2598	0.0000
agedxcat (60-69/20-29)	2.8767	2.1372	3.8722	1.0567	0.1516	6.9694	0.0000
agedxcat (70-79/20-29)	3.1926	2.2826	4.4653	1.1608	0.1712	6.7810	0.0000
agedxcat (80 and over/20-29)	3.6141	2.4801	5.2665	1.2848	0.1921	6.6881	0.0000
racecat (b. Black/a. White)	1.1357	0.9821	1.3134	0.1273	0.0742	1.7162	0.0861

(table continues)

Term	Odds Ratio	95%	C.I.	Coefficient	S. E.	Z-Statistic	P-Value
racecat (c. Other/a. White)	1.1085	0.7911	1.5534	0.1030	0.1722	0.5985	0.5495
maritalcat (b. Single/a. Married)	1.2018	1.0427	1.3851	0.1838	0.0724	2.5378	0.0112
maritalcat (c. Separated/Divorced/a. Married)	1.1634	0.9862	1.3724	0.1513	0.0843	1.7947	0.0727
maritalcat (d. Widowed/a. Married)	1.0221	0.8251	1.2662	0.1604	0.1092	0.2003	0.8412
inscat (Medicaid/ /Insured)	1.7226	1.5127	1.9708	0.5462	0.0675	8.0938	0.0000
inscat (Uninsured/ Insured)	2.2948	1.8120	2.9061	0.8306	0.1205	6.8927	0.0000
ethniccat (Non-Hispanic/Hispanic)	1.1685	0.9768	1.3978	0.1557	0.0914	1.7037	0.0884
YRDx	1.0365	0.9963	1.0784	0.0359	0.0202	1.7743	0.0760
CONSTANT	*	*	*	-8.7629	4.2450	-2.0643	0.0390
Convergence:		Converged		C			
Iterations:		5					
Final -2*Log-Likelihood:		6994.0350					
Cases included:		5261					

Test	Statistic	D.F.	P-Value
Score	285.19	15	0.0000
Likelihood Ratio	292.17	15	0.0000

Summary of Findings

The results of this study indicated according to the two way association analysis that there was a greater percentage of women age 50 and over in the late stage at diagnosis group versus the early stage group ($p = 0.0000$). There was a greater percentage of African American women in the late stage group ($p = 0.0000$), and there were more women that were separated, divorced and widowed in the late stage group versus the early stage group ($p = 0.0000$). More women who were uninsured were in the late stage group ($p = 0.0000$), and there were more women in the late stage group born in the United States versus being born outside of the United States ($p = 0.0000$). The logistic regression models were significant for the total group of women ($p = 0.0000$) as well as for all the subgroups ($p = 0.0000$). Logistic regression analyses demonstrated that there was a significant increase in the risk of being diagnosed with late stage cervical cancer in uninsured women and women insured by medicaid ($p = 0.0000$). Single, separated and divorced women were at greater risk of late stage diagnosis ($p = 0.0000$), while women born outside of the United States had a lower risk of late stage diagnosis versus women born in the United States (*OR* 0.67, $p = 0.0000$). The findings are further interpreted and discussed in Chapter 5 as well as the social change implications and recommendations.

Chapter 5: Discussion, Conclusions, and Recommendations

Introduction

The purpose of this study was to test whether cervical cancer patients differ in regards to their stage of cervical cancer at diagnosis based on their insurance status, country of birth, age, race, ethnicity, or marital status. Specifically, this study examined insurance coverage and whether or not coverage made a difference in the stage at diagnosis, as well as country of birth and whether or not that had an impact on the stage at diagnosis.

This study was a quantitative, retrospective, cross-sectional study that included data from 7,445 women with a diagnosis of cervical cancer from the years 2008 through 2012. The data were obtained from the NCI SEER database. The key findings included women born outside of the United States had a lower risk of being diagnosed with late stage cervical cancer than women born inside the United States ($OR = 0.67$, $p = 0.0000$). Women with Medicaid insurance had a greater risk being diagnosed with late stage disease ($OR = 1.50$, $p = 0.0000$) as did uninsured women ($OR = 1.77$, $p = 0.0000$). Insured women born outside of the United States did not have a lower risk of late stage diagnosis like their *Medicaid* and *uninsured* counterparts. African American women were found to be at a slightly greater risk of late stage disease; however, these findings were not statistically significant ($OR = 1.15$, $p = 0.0527$). Also, women over the age of 40 had an increased risk of being diagnosed with late stage disease.

Interpretation of the Findings

Some studies have shown that there are geographical disparities among women diagnosed with cervical cancer. Hispanic women living on the Texas border of Mexico have a higher mortality rate from cervical cancer, and there are higher mortality rates among Caucasian women in Appalachia, rural New York State, and northern New England (Coughlin et al., 2008). Only one study was found examining the correlation of late stage cervical cancer with country of birth. According to Miller, Kolonel, Bernstein, Young, and Swanson (1996), Vietnamese women have a fivefold higher rate of cervical cancer versus Caucasian women in the United States (NCI, 2008). The present study confirmed that there may be a geographical difference in late stage cancer diagnoses. Results showed that women born outside of the United States had a lower risk of being diagnosed with late stage cervical cancer. Specifically, women born in Mexico, the Phillipines, Vietnam, and other countries had a lower risk of late stage disease. Women born in El Salvador had a lower risk ratio; however, this was not significant. The present study found that women born in Vietnam living in the United States between 2008 and 2012 had a significantly lower risk of being diagnosed with cervical cancer while insured with Medicaid then Caucasian women born in the United States.

The literature review found that women who are diagnosed with a late stage (Stage III or IV) cervical cancer are more likely to be African American, over 50 years of age, and not have had a pap smear in the previous 5 years from their diagnosis (ACS, 2009). The present study confirmed that women were more likely to be over 50 years of age with a late stage diagnosis; however, there was no significantly higher risk of African American women being diagnosed with late stage disease than Caucasian women. There was no information collected regarding pap smears.

According to the ACS, Hispanic women shoulder the burden of the highest proportion of new cases of cervical cancer (ACS, 2012). The present study looked at cervical cancer cases diagnoses between 2008 and 2012; there were no significant differences in late stage diagnoses by the year of diagnosis. Results indicated that between 2008 and 2012 there were no significant differences between Hispanic and nonHispanic women and late stage diagnosis of cervical cancer.

The ACS has stated that individuals that do not have health insurance are more likely to be diagnosed at a later stage of disease (ACS, 2012). According to Andersen’s (1995) model, health insurance is an enabling factor for access to health care. The present study confirmed that uninsured women had a significantly higher risk of being diagnosed with late stage disease which would confirm that they may not have had access to care. However, an interesting finding in the present study was for Hispanic women. When selecting out the Hispanic population, there were no significant differences between women with Medicaid, uninsured, and insured and late stage diagnosis. If health insurance is an enabling factor for access to healthcare, one would think the uninsured group would have had a higher risk of late stage disease even in the Hispanic subgroup versus the overall cohort. This begs whether or not the ACS’s (2012) statement was accurate for the Hispanic population and should be examined further.

In a study that examined a secondary data set from the California Cancer Registry–Medicaid linked file to identify all Californians diagnosed with invasive cervical cancer during 1996 through 1999 and their Medicaid enrollment status, O’Malley et al. (2006) found that women enrolled in Medicaid had an odds ratio of 2.8 versus non-Medicaid enrollees of having a late stage diagnosis. The present study looked at the SEER database across multiple states which included California and confirmed O’Malley et al.’s findings that women with Medicaid have an increased risk of having a late stage diagnosis versus women who were insured.

Out of the studies that looked at marital status and late stage cervical cancer diagnosis, Ferrante et al. (2000) found that unmarried women were at a greater risk of being diagnosed with late stage disease. The present study also confirmed that some unmarried women were at greater risk, namely, the single and separated/divorced subgroups respectively. Widowed women were not found to be at greater risk in the present study.

Limitations of the Study

Although many researchers have used many cross-sectional study designs, the retrospective cross sectional study design only assesses an association in a single point in time. Only data from 2008-2012 were included and data were only available up to 2012. Education and income variables were not included in this study because they were not available in the SEER database. Hispanic cases could have been misclassified based on the Spanish/Hispanic origin and/or surname for identifying Hispanic cases. The country of birth variable was biased due to it being based only on death certificates. The stage at diagnosis was defined as dichotomous where Stage I and II were defined as early stage cervical cancer and Stage III and IV were defined as late stage cervical cancer, and there could have been some misclassification of disease at diagnosis in the SEER database if registries reported inaccurate data. Other socioeconomic variables that may have elucidated other potential confounders in this study, like education level and or income level, were not studied. This study did not include biological, environmental, or behavioral risk factors that could have had confounding effects on variables if examined.

Recommendations

The findings of this study revealed that further research is needed to identify factors to understand why women born outside of the United States have a lower risk of a late stage cervical cancer diagnosis versus women born in the United States. This result was consistent in the Hispanic subgroup, Medicaid subgroup, and the uninsured subgroup but was not significant in the insured subgroup. The question bears asking: why would women who were born outside of the United States that are insured not have a lower risk of late stage cervical cancer diagnosis like their Medicaid and uninsured counterparts? The result of there being no significant difference in late stage diagnosis in the overall cohort of Hispanic versus nonHispanic women needs to be further elucidated. The women in this study that had a greater risk of being diagnosed with late stage disease were over age 40 years, born in the United States, had Medicaid or no insurance, and were unmarried.

Implications for Social Change

The implications for social change from this research include a better understanding of disparities related to late stage cervical cancer diagnosis. The results of this study confirmed the existence of marital disparities and country of birth disparities with late stage disease. This study did not confirm the presence of racial disparities between African American and Caucasian women in the overall cohort as well as in any of the subgroups examined. This finding could be an indication that health programs designed to target minorities in order to lessen the gap in racial disparities are working. This study should send a signal to healthcare providers, as well as public health organizations, to direct their actions toward not just racial disparities, but towards all groups currently being diagnosed with late stage disease. It will be essential to target marital disparities and country of birth disparities as well. Further research should be conducted to determine factors that may be associated with the country of birth disparities or if this finding is a result of data bias before programs are geared towards this finding.

Conclusion

In summary and with understanding of the country of birth variable bias, this study revealed that women born outside of the United States have a lower risk of late stage cervical cancer diagnosis versus women born in the United States. This study also provided further evidence that women using Medicaid and uninsured women have a greater risk of being diagnosed with late stage disease than insured women; however, this result did not hold true for the Hispanic subgroup. It also provided further evidence that unmarried women, with the exception of widowers, have a greater risk of late stage diagnosis than married women. Surprisingly, this study did not find disparities between black and white women and late stage disease in the overall cohort.

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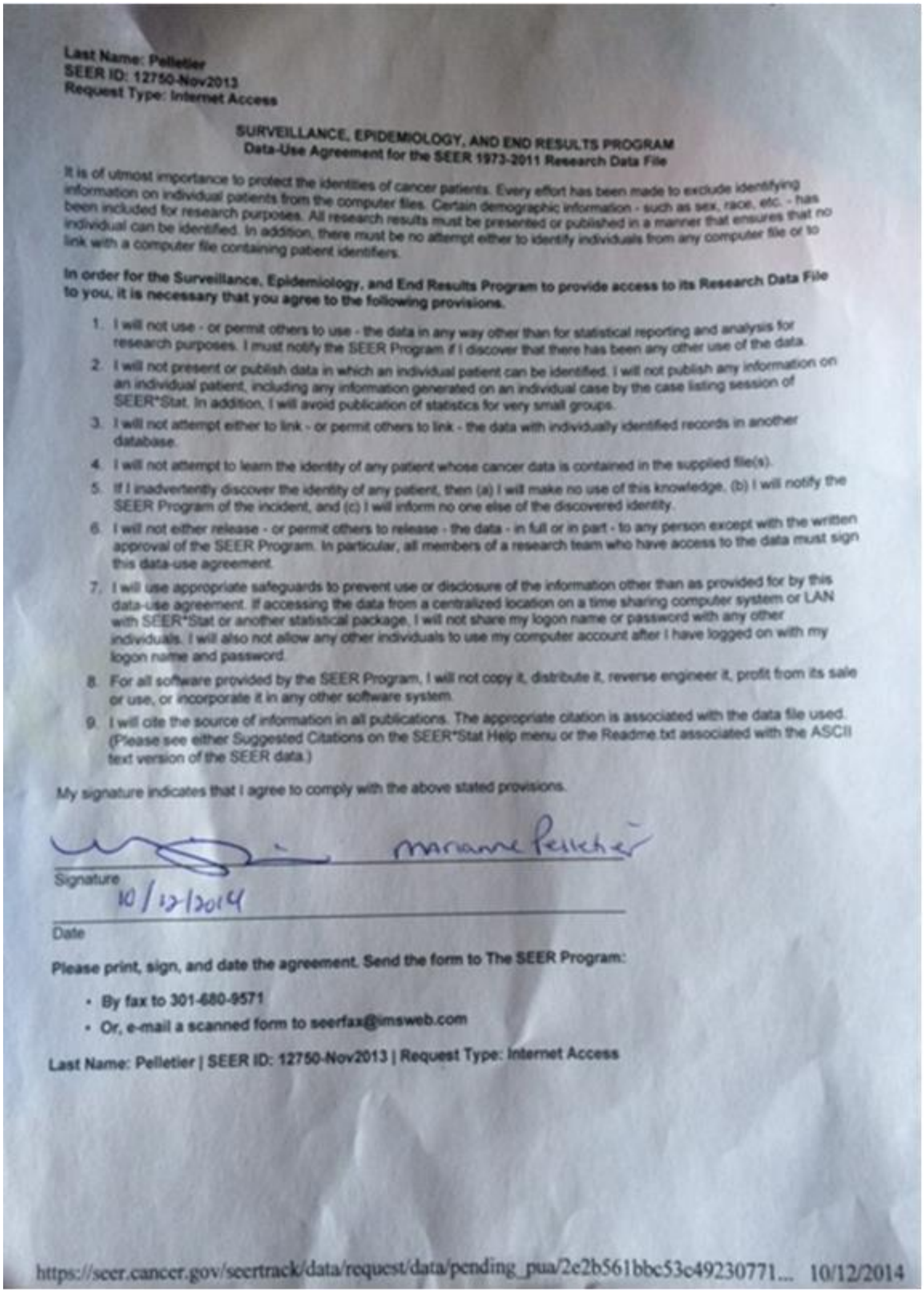
Appendix A: Seer Data Agreement



Last Name: Pelletier
SEER ID: 12750-Nov2013
Request Type: Internet Access

SURVEILLANCE, EPIDEMIOLOGY, AND END RESULTS PROGRAM
Data-Use Agreement for the SEER 1973-2011 Research Data File

It is of utmost importance to protect the identities of cancer patients. Every effort has been made to exclude identifying information on individual patients from the computer files. Certain demographic information - such as sex, race, etc. - has been included for research purposes. All research results must be presented or published in a manner that ensures that no individual can be identified. In addition, there must be no attempt either to identify individuals from any computer file or to link with a computer file containing patient identifiers.

In order for the Surveillance, Epidemiology, and End Results Program to provide access to its Research Data File to you, it is necessary that you agree to the following provisions.

1. I will not use - or permit others to use - the data in any way other than for statistical reporting and analysis for research purposes. I must notify the SEER Program if I discover that there has been any other use of the data.
2. I will not present or publish data in which an individual patient can be identified. I will not publish any information on an individual patient, including any information generated on an individual case by the case listing session of SEER*Stat. In addition, I will avoid publication of statistics for very small groups.
3. I will not attempt either to link - or permit others to link - the data with individually identified records in another database.
4. I will not attempt to learn the identity of any patient whose cancer data is contained in the supplied file(s).
5. If I inadvertently discover the identity of any patient, then (a) I will make no use of this knowledge, (b) I will notify the SEER Program of the incident, and (c) I will inform no one else of the discovered identity.
6. I will not either release - or permit others to release - the data - in full or in part - to any person except with the written approval of the SEER Program. In particular, all members of a research team who have access to the data must sign this data-use agreement.
7. I will use appropriate safeguards to prevent use or disclosure of the information other than as provided for by this data-use agreement. If accessing the data from a centralized location on a time sharing computer system or LAN with SEER*Stat or another statistical package, I will not share my logon name or password with any other individuals. I will also not allow any other individuals to use my computer account after I have logged on with my logon name and password.
8. For all software provided by the SEER Program, I will not copy it, distribute it, reverse engineer it, profit from its sale or use, or incorporate it in any other software system.
9. I will cite the source of information in all publications. The appropriate citation is associated with the data file used. (Please see either Suggested Citations on the SEER*Stat Help menu or the Readme.txt associated with the ASCII text version of the SEER data.)

My signature indicates that I agree to comply with the above stated provisions.

marianne Pelletier
Signature

10/12/2014
Date

Please print, sign, and date the agreement. Send the form to The SEER Program:

- **By fax to 301-680-9571**
- **Or, e-mail a scanned form to seerfax@imsweb.com**

Last Name: Pelletier | SEER ID: 12750-Nov2013 | Request Type: Internet Access

https://seer.cancer.gov/seertrack/data/request/data/pending_pua/2e2b561bbc53c49230771... 10/12/2014