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Dissertation: Sociodemographics and Pancreatic Cancer Survival Rate

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Abstract

Sociodemographics and Pancreatic Cancer Survival Rate

by

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Dissertation Submitted in Partial Fulfillment

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Abstract

Pancreatic carcinoma or pancreatic cancer (PaCa) is an insidious disease with a prognosis of 6- to 12-month survival time for a late stage diagnosis. This problem has become crucial given that no study to date had been able to establish a definitive association between independent factors (other than a few diseases) and the survival rate of pancreatic cancer. The purpose of this quantitataive, cross-sectional study was to determine whether an association exists between the independent, sociodemographic variables (marital status, age, education, income, and employment) and the outcome variable of survival rate. The social cognitive theory was the framework that provided the blueprint throughout the development of this study and helped guide the analysis of the secondary data, which was procured from the surveillance, epidemiology, and end results program. The sample of 56,166 participants was collected from 2009 to 2013 and Cox proportional hazard was used to analyze the data and arrive at the answers to the research hypotheses. A Cox proportional hazard model was used to analyze whether an association existed between each of the independent variables and the outcome variable. The analysis showed significant association between age, education, income, and employment and survival rate. It was not the same for marital status. These findings could stimulate social change by allowing stakeholders and other policy makers to become aware of the role that sociodemographic factors can play in health care. In addition, a need exists for effective research to be undertaken in the prevention and intervention of this disease. This could then lead to private and public health innovations and procedures to benefit patients with PaCa.

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Dedication

I dedicate this study as a tribute to the lasting memory of my maternal grandmother, who first pointed me to Jesus Christ, then instilled in me a thirst for knowledge. She believed in education, and singlehandedly has been responsible for all my achievements in this life. She always reminded me that “there is no path. We make it with each step we take.” She is now receiving her reward from her heavenly father and maker, whom she trusted all her life.

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I also owe much gratitude to Mr. Dave Campbell, System Analyst and very knowledgeable member of SEER*Stat Technical Support. He gave of his time unselfishly and unsparingly to ensure that all my questions, concerns, and complex statistical, programming questions were answered. His every-ready support in the area of software analysis was always available. Many thanks, Mr. Campbell. And to my dear wife, Jocelyn Lewis, thank you for your love, support, encouragement and patience; but above all thank you for your consistent prayers.

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Chapter 1: Introduction to the Study

Introduction

The pancreas is an organ located in the abdomen behind the lower part of the stomach. Pancreatic carcinoma, also known as pancreatic cancer (PaCa), typically develops in the tissues of the pancreas. Because of its location within the body, the diagnosis and treatment of PaCa is a primary concern of medical, public health, and epidemiologic personnel. According to the National Cancer Institute (2015), PaCa causes 6.8% of all cancer-related deaths in the United States, accounts for 2.8% of all new cancer cases in the United States and has a 5-year survival rate of 6.7%. The survival rate depends on many factors, such as the stage at which the cancer was first diagnosed, and from which of the three areas of the pancreas the cancer originated: head, body, or tail of the pancreas (Johns Hopkins Medicine, n.d.).

In 2011, approximately 43,538 persons lived with PaCa in the United States, but it was predicted that 48,960 people would be diagnosed with PaCa in 2015; of these, 24,840 will be men and 24,150 will be women. According to the American Cancer Society (2015), approximately 40,560 people will die of PaCa in 2015, of whom 20,710 will be men and 19,850 will be women. One of the challenges surrounding PaCA is that it provides little or no signs/symptoms that it has invaded the body. Given the asymptomatic presentation of PaCa, understanding risk factors associated with not only prognosis, but also survival, becomes important.

The risk of developing PaCa is approximately 1 in 67, or 1.5% (American Cancer Society, 2015). Although the odds (1 in 67) might seem negligible, understanding the

types of risk factors, and the degree of significance of these risk factors, which are associated with the survival of PaCa, is an integral part of addressing the survival rate question. Lambe, Eloranta, Wigertz, and Blomqvist (2011) have suggested that because the etiology of PaCa is far from being understood, this may be a reason for the low survival record of PaCa patients.

Background of Study

According to Cancer Research UK (2012), the 5-year survival rate for men stands at 3.6%. Because of such data, I decided to undertake this study. Currently, four primary treatment methods for PaCa exist: surgery, chemotherapy, radiation, and ablative techniques. Although new research is being conducted to find new treatment methods, these address the problem only after diagnosis had been made, not before. As such, it is important to consider not only factors that contribute to the development of PaCa, but also factors that could affect survival following a diagnosis.

Golubnitschaja et al. (2016) looked at the possibility of new social challenges as having an effect on the outcome of breast cancer. In this study, I have hypothesized that these challenges might be as a result of the lifestyles of the early twenty-first century compared to those, which their counterparts faced in the past. Significant in this study is that medical or clinical factors were not selected for analysis as possible risk factors. Instead, occupational exposure, socioeconomic conditions, and other modifiable risk factors were identified with the aim of determining what level of lifestyle improvement, and, concomitantly, what rate of survival gain can breast cancer patients hope to attain. This same thought could \ be applied to PaCa. Crippa et al. (2008) emphasized the quality

of life pancreatic patients' lives, and the chances of survival they face as a result of these quality of life factors. PaCa and breast cancer are two life situations that similarly present hopelessness with a difference: the 5-year survival rate for breast cancer (89.7%) as against that of PaCa for all genders (8.2%) has provided the need for studies to be carried out on nonmedical and nonclinical factors.

Similarly, Abraham et al. (2013) examined disparities in pancreas cancer care. The researchers concluded that because there is the tendency for demographics to change with time, it became necessary for constant tests of associations between variables to be carried out. Their logic was, if meaningful results were to be obtained, future studies should be undertaken. Arguments along these lines seem to indicate a problem in establishing associations between sociodemographics and the survival rate of this disease.

In two studies conducted by Falagas et al. (2007) and Crippa et al. (2008), respectively, they both used a descriptive format for the data analysis to summarize demographics and clinical characteristics associated with outcomes. Whereas Falagas' study dealt with the effects of psychosocial factors on breast cancer, and Crippa's dealt with quality of life in PaCa patients, both studies found that there was at least an association between one of the independent variables and their respective outcome variable. Their findings formed an important conceptual framework. This framework is one on which the establishing of an association between survival rate of PaCa and sociodemographic factors can be modeled.

Capellani (2012) and Nitsche (2011) examined predisposing factors such as diet, genetics, and workplace environment; however, they concluded that much work needs to

be done in identifying factors that can be associated with the survival rate of persons who have developed cancer of the pancreas. Cheung (2013) provided additional support for further studies to be undertaken. Cheung urged that the need for additional studies should be to establish an association between nonmedicine factors and the survival rate of persons who suffered with cancer of the pancreas. Cheung was able to come to this conclusion about this existing need based on his observation that there was "scant" data from published studies on the relationship between sociodemographic factors and PaCa survival rate (Cheung, 2013). Therefore, I attempted to establish an association between risk factors such as sociodemographics and the survival rate of PaCa.

Problem Statement

The problem that continues to exist is whether factors other than medical ones may be associated with an improved rate of survival for those persons who have developed PaCa. The nature and cause of this disease is such that many researchers have concluded that PaCa is an insidious disease, with a 5-year average survival rate of 7.7%. Should the disease be detected when it is in the distant stage, or metastasizing, the 5-year survival rate drops to 2.3% (Figure 2) (National Cancer Institute, 2015; Cancer Treatment Center, 2015).

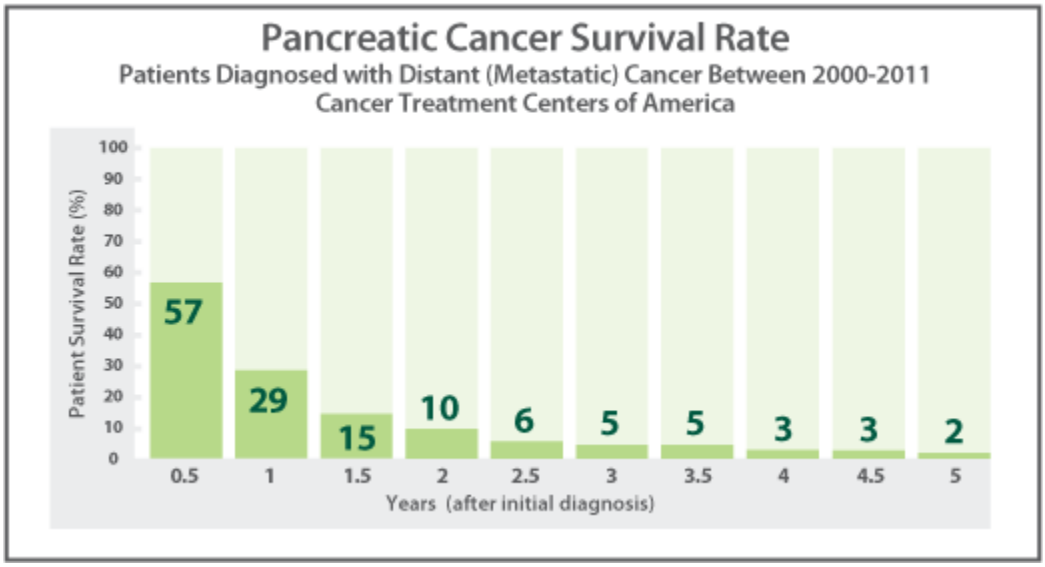

Figure 1. PaCa survival rate after initial diagnosis. Patient survival following a diagnosis of metastatic (Stage 3) PaCa decreases significantly over time, with the overwhelming majority not surviving beyond the first year following diagnosis. Source is public domain; no permission required to reproduce: Cancer treatment of America: http://www.cancercenter.com/pancreatic-cancer/stages/

The literature has shown that studies have been done on PaCa with the purpose of arriving at cures, causes, and palliative relief for PaCa patients. Medical factors, such as diabetes, pancreatitis, and obesity, have been studied. However, the literature has not sufficiently examined sociodemographic factors as having some association with the survival rate of cancer of the pancreas. The fact that the mortality rate virtually has remained the same since 2010 presents a problem (Gong et al., 2012). There seemed to be a general awareness of the problem, which has created the need to identify factors other than the customary ones for addressing the survival rate of PaCa patients. In February 2015, the NCI Research Division, which has funded research universities such as Indian University, concluded that a need exists to focus on transdisciplinary research, including population science to address lagging cancer problems (National Cancer Institute, 2015).

In their study, Junior et al. (2015) advanced the argument that the overall survival of patients who have been diagnosed with metastatic PaCa may be determined by where and how treatment is delivered. Because the results of their study showed that the only factor that might have been associated with an increased survival rate for PaCa was chemotherapy, the study suggested that better access to treatment options along with the addressing of socioeconomic inequalities might provide better answers to the dilemma of PaCa survival rate. Those findings were supported by Vohra, Marmot, Bauld, and Hiatt (2016) in their synthesis of 13 studies, primarily in Europe. In this study they seemed to suggest that a more influential set of indicators were needed to be examined for possible association with the survival rate of PaCa. The argument was made that although cancer stage at diagnosis and other adult morbidities may be determinants of pancreatic survival rate, social determinants can often provide a disadvantage, which can begin before birth and manifest itself throughout the adult life of the patients. I directly address this gap that both sets of authors revealed, that is, sociodemographics as having a possible association with the survival rate of PaCa.

Nipp et al. (2018) opined that other than increasing age, a risk factor that concurred with my study's finding, the medical arena is still looking at chronic pancreatitis, Type 2 diabetes, and other complex geriatric issues as risk factors to the survival rate of this insidious disease. In addition, PaCa was seen as having the worst prognosis of all cancers (Nipp et al., 2018). The disease is often diagnosed at such a late stage that surgery seemed an option for only 17.8% of patients at the point of diagnosis; and even then, a disparity exists in the median survival rate among age groups. All cases

for age group 66 to 69 years showed a median survival of 18 months; whereas those for 85 years and older showed a median survival of 4.8 months (Nipp et al., 2018). These current figures for PaCa have not changed appreciably. Most researchers seemed to suggest that additional studies should be carried out on nonmedical factors that might be associated with PaCa (Hocevar et al., 2014; Canto et al., 2013).

Purpose of the Study

The purpose of this study was to determine whether an association exists between each of the independent sociodemographic variables (marital status, age, education, income, and employment) and survival rate. This purpose arose as a result of recommendations from the literature that there should be further research on nonmedical factors that might affect the outcome of survival (Cheung, 2013). I used the Surveillance, Epidemiology, and End Results (SEER) database to determine to what extent this association exists among men and women within the contiguous states of America, and Alaska and Hawaii. Data from 2010 to 2012 showed that the lifetime risk for both men and women developing cancer is 1.5%; and that 49,620 persons were living in 2013 with PaCa in the United States alone (National Cancer Institute, 2016). These data seemed to suggest that the results of this quantitative study could be instrumental in helping health care professionals, government policy makers, and all stakeholders, who would be interested in effecting social change to achieve their goals of possible increasing the survival rate of PaCa. A need also exists to embrace the results of all related studies on PaCa as a potential path to social change.

Research Questions and Hypotheses

These research questions set the parameters upon which each respective hypothesis was designed:

- RQ1: Is there an association between marital status and the survival rate of PaCa?
    - H_0: There is no association between marital status and the survival rate of PaCa.
    - H_1: There is an association between marital status and the survival rate of PaCa.
- RQ2: Is there an association between age and the survival rate of PaCa?
    - H_0: There is no association between age and the survival rate of PaCa.
    - H_1: There is an association between age and the survival rate of PaCa.
- RQ3: Is there an association between levels of education and survival rate of PaCa?
    - H_0: There is no association between levels of education and the survival rate of PaCa.
    - H_1: There is an association between levels of education and the survival rate of PaCa.
- RQ4: Is there an association between income and the survival rate of PaCa?
    - H_0: There is no association between income and the survival rate of PaCa.
    - H_1: There is an association between income and the survival rate of PaCa.
- RQ5: Is there an association between employment status and the survival rate of PaCa?

- H_0: There is no association between employment status and the survival rate of PaCa.
- H_1: There is an association between employment status and the survival rate of PaCa.

For this study, income (designated as median family income) was divided into three categories: (a) ≤ $50,000; (b) $51,000 to $64,000; and (c) ≥$65,000. The first category was coded as 1, the second category was coded as 2, and the third category was coded as 3. A complete discussion of the research design, including pertinent information on how variables were measured, can be found in Chapter 3.

Nature of the Study

This was a quantitative, cross-sectional study in which I analyzed secondary data obtained through the SEER program. For the purposes of this study, *cancer stage*, used merely as exploratory, is defined as the extent of the cancer within the body. This can be any of four stages, defined by SEER: localized (or Stage 1), which is confined to primary site; regional (or Stage 2), which has spread to regional lymph nodes; distant (or Stage 3), which has already metastasized; and unknown (or Stage 4), which is distant, but involving the blood vessels (National Cancer Institute, n.d.). Oncologists regard the stage of the tumor, *ceteris paribus*, as being a factor in the diagnosis of the disease. For this study, the degree to which stage might be a factor, however, may depend on the significance of the association between each of the sociodemographics (independent variables) and the survival rate of PaCa. The stage of PaCa is instrumental in helping an oncologist to design treatment options for a cancer patient. Moreover, it is a useful

indicator as to whether the cancer has reached surrounding tissues, or whether it has progressed beyond to blood vessels (Cancer Treatment Centers of America, 2015).

Given that this was a cross-sectional study, the cases that I interviewed were not followed over a period of time. Accordingly, I analyzed a static population with the goal of arriving at the association between independent variables and outcome at a moment in time. I analyzed data from 2008 to 2012 only. This population subset was part of SEER 18 Registries, which housed statistics for diagnosis years 1973 to 2012. I present thorough treatment of the study population in Chapter 3.

Theoretical Base of the Study

According to Glanz and Rimer (2005) theories provide many useful functions for any researcher who would use them. The use of a theoretical base to guide this study, therefore, is needed. This dissertation research is based on Social Cognitive Theory (SCT). This theoretical model was first introduced in 1941 by Miller and Dollard (Culatta, 2011). However, the more popular name of Bandura, along with a colleague, Walters, revised the theory to include several constructs that became an important frame work for researchers interested in behavioral change (Barnowski, Perry, & Parcel, 1997). Appropriate for this study is Denler, Wolters, and Benzon's (2014) reporting that SCT has been applied broadly to several areas of public health. Additional testimony on the effectiveness of this theory in the areas of behavior pathology and health promotion exists (Bandura, 1977).

The applicability of this theory to this study is that it informs the approach that one envisions when pondering an association between sociodemographics, such as

marital status, age, education, income, and employment and PaCa survival rate. Among health behavior theories SCT is the theory of choice by researchers (Glanz & Rimer, 2005). SCT, therefore, provides a solid framework through several of its constructs. The principle of reciprocal determinism speaks of interaction between the patient and his/her environment. There is also the construct of behavioral capability, where the patients are provided with the necessary resources to engage in the expected behavior. This theory will be instrumental in describing the scope where cancer patients are able to accommodate their expectations, or at least have the room to anticipate certain outcomes from their own behaviors (Glanz & Rimer, 2005).

Several other constructs exist. One of these guides the interpretation of the results of this study in Chapter 4. This construct is self-efficacy, where patients who have been diagnosed with PaCa need to have confidence in their own abilities to take action to overcome the negative results of diagnoses, treatment, and outlook. The understanding of self-efficacy is important if social change is to be realized (Nursing Theories, 2012).

To recap, the constructs presented (Table 1) inform the data that I collected from both the SEER and County databases, and established a relationship between the collected data and the constructs:

- Reciprocal determinism informs the analysis of the independent variable age, which is data collected by SEER. Marital status and income, although not collected by SEER, are part of the county data. They are all demographic data and allow the assessing of a patient's ability to interact with others in the environment.

- Behavioral capability describes the behavior pattern of patients through their educational and income levels. This coincides with the concept of acquired and learned behavior. The data were made available through the county.
- The construct expectations speak directly to the variable, *survival rate*, which is the expected outcome. These data were collected by SEER.
- The construct self-efficacy depends on all of the constructs working together. The patient is the main individual that is called upon to mobilize all of the independent variables. The outcome depends on confidence in the patient's own abilities to overcome many obstacles. Self-efficacy can be classified as an intangible, independent variable, which will depend on the analysis, results, and interpretation of the data.

Table 1

SCT Constructs and Their Relationships to Study variables

SCT construct	Description	Database	Study variables
Reciprocal determinism	Demographic data	SEER: Age County data: Marital Status and median family income	Independent
Behavioral capability	Demographic data	County data: Education and Employment	Independent
Expectations	Diagnosis of PaCa, Survival rate	SEER: Summary staging	Dependent
Self-efficacy	Demographic data	SEER and county sociodemographics	Independent

Definition of Terms

Cancer burden: A measure of the incidence of cancer within the population and an estimate of the financial, emotional, or social impact it creates. The burden of disease is not borne equally by all population groups in the United States (National Cancer Institute, n.d.).

Cancer stage: The extent of a cancer within the body. If the cancer has spread, the stage describes how far it has spread from the original site to other parts of the body (National Cancer Institute, n.d; Cancer Treatment Centers of America, 2015).

Cox proportional hazard model: A statistical technique for exploring the relationship between several explanatory variables and the survival of a patient (Walters, 1999).

Cross-sectional: A type of study design the main goal of which is to have a random sample of individuals respond to preset questions administered chiefly through questionnaires. The main aim of the study is to determine the sample's experiences, their attitudes, and other background traits (Frankfort-Nachmias & Nachmias, 2008).

Genetics: A term associated with *gene,* which is piece of DNA (*deooxyribonucelic acid*) inside a cell that has the information to make a specific protein. *Genetics*, therefore, is an association of certain DNA traits with persons that make them susceptible to diseases (American Cancer Society, 2016). Genetic cancer becomes a consideration when it is believed that someone has developed cancer because of familial predispositions to it. *Genetics* becomes another risk factor over external factors, such as smoking.

Immunotherapeutic: A newly discovered approach for reducing tumor growth and progression in which antibodies are injected into the patients, thereby causing the immune system to be able to attack the tumor and without any major side effect in most cases (Johns Hopkins Medicine, n.d.).

Pancreas: The elongated organ that sits behind the stomach, deep into the abdominal cavity. This organ serves two functions: (a) it produces digestive enzymes which regulate the flow of sugar entering the blood stream; (b) it regulates hormones

PaCa: This is a disease in which malignant cells (cells that have become cancerous) are found in the tissues of the pancreas. An alternative name for this type of cancer is *exocrine* cancer (National Cancer Institute, n.d.).

Regional: Cancer that has spread to another part of the body, sometimes referred to as *distant.*

Surveillance Epidemiology and End Results (SEER): This is a government kept and managed registry that is a collection of population-based cancer registries in the United States used to collect and submit cancer incidence and follow-up data to the National Cancer Institute (National Cancer Institute, n.d.).

Sociodemographics: The acceptable form of defining birth and social factors, economic factors, and even environmental ones such as age, income, sex, education, occupation, etc., especially when used to identify risk factors (Gjonca & Calderwood, 2004).

Summary staging: The most basic way of categorizing how far a cancer has spread from its point of origin. Summary staging has also been called general staging, California staging, and SEER staging. The 2000 version of summary stage applies to every anatomic site, including the lymphomas and leukemias. Summary staging uses all information available in the medical record; in other words, it is a combination of the most precise clinical and pathological documentation of the extent of disease (SEER Summary Staging Manual, 2000).

Survival rate: A comparison of those persons who have been diagnosed with cancer with those persons of the same age, race and sex who have not been diagnosed with the same form of cancer (NCI, 2011).

Survivorship support: Treatment that takes into consideration, and also plan for the possibility of three types of side effects. These side effects are not exclusive and may include the discovery of other categories of support. The three types of side effects are (a) short term side effects, (b) long-term side effects, and (c) late side effects (Cancer Treatment Centers of America, 2015).

Whipple: This is a surgical procedure which is performed on persons diagnosed with PaCa. The goal is to remove cancer in that portion of the pancreas that is called the "head." This procedure is to ensure that the cancer does not spread to nearby areas. Accordingly, the surgeon will remove not only the cancerous tissue, but will remove the bile duct, small intestine, and stomach, and perform immediate construction (Cancer Treatment Centers of America, 2015).

Assumptions

The use of SEER 18 registry (secondary data) necessitates two basic assumptions: (a) the designers of the surveys and the collectors of the information provided each and every respondent who was willing to participate with the opportunity to do so; and (b) all cancer registries followed the guidelines set forth by the National Comprehensive Care Network.

Scope and Delimitations of the Study

This study entailed cases from only 2009 to 2013, the most recent 5-year period collected. This reduces the large number of cases available from the registries and sets the boundaries that define the sample size. This decision, therefore, confined the study to the most recent cases. The size of the population sample is further compromised; for although SEER 18 Registries consists of SEER 17, like previous registries, adjustments for the areas impacted by Hurricane Katrina and Rita were made (National Cancer Institute, 2014). This reduces the total number of cases that should have been reported for 2008 to 2009.

Limitations

The decision to use a cross-sectional design for this study presented certain limitations, the main being the inability to follow cases over a period of time so that old cases can be tracked for significant tumor changes. Cross-sectional studies give the readers a one-time snapshot of the patient's condition for a particular period. Similarly, the choice of data collection method (secondary sources) provide the researcher with no option to assess whether bias occurred in the collecting of the data, because the

determination of whether missing data was random or nonrandom would not be possible. Nonrandom missing data could result in bias (Smith et al., 2011). The question of follow-up, therefore, becomes impossible, but, nevertheless, it can pose a limitation, because without follow-up mechanism in place, more realistic calculations cannot be achieved.

For this study, SEER data 2000 to 2013 were available, with an all-cases figure of 8,832,160. However, following some of the tenets of cross-sectional designs, taking time and cost into consideration became important. Knowing that the larger the cases studied the greater the degree of validity, and also that I analyzed only cases collected from 2009 to 2013, the most recent data recorded, there was the possibility that validity could be compromised to some extent. Another limitation was that although SEER 18 Registries consisted of SEER 17, like previous registries, adjustments for the areas affected by Hurricanes Katrina and Rita were made (SEER, 2011). This reduced the total number of cases that should have been reported for the years through 2013.

Significance of the Study

PaCa is an insidious disease because it gives no warning signs or symptoms to persons until, in most cases, they are in Stage 4 of the disease. As a result, it is now listed as the fourth leading cause of death among cancer patients (Johns Hopkins Medicine, n.d.). Despite the many efforts made through the years at innovative medication and surgical procedures to increase the survival rate of persons who developed PaCa, it is still a low 7.7% (National Cancer Institute, 2016). Furthermore, although PaCa represents a mere 3.1% of all new cancer cases (National Cancer Institute 2016), the slow upward change in its survival rate coupled with little change in the effectiveness of traditional

cures has increased the significance of this study. Past researchers have recommended that future studies should identify other risk factors that may be associated with this form of cancer. These are some of the reasons that have given significance to this study and have helped shape the hypothesis that an association exists between sociodemographic variables (marital status, age, education, income and employment) and the outcome, survival rate.

Kagedan et al. (2016) addressed the question of adjuvant therapy, mainly surgical resection as currently the only realistic chance of improvement in the survival rate of PaCa. They have admitted in their study that controversy continues to persist on socioeconomic risk factors. The conclusion drawn from this study is that whenever the opportunity arises for the development of palliative care for persons suffering from cancer of the pancreas, that much consideration should be given to social and other health-related quality of life measures. This preceding thought coupled with the results from this study just may be the catalyst for bringing about social change in the lives of the millions who have developed PaCa. This can be done by the setting of further agendas for community discussions via stakeholders which include, but not limited to, politicians, public health officials, and other groups of influence.

Summary and Transition

In Chapter 1, I introduced the study to its readers by presenting the background that deals with recent PaCa survival rate and current treatment methods. The main problem of whether factors other than medical ones are associated with the survival rate of PaCa becomes a concern. The purpose of this study was to determine whether an association between sociodemographics and PaCa survival rate exists. The significance of this study stems from the knowledge that while PaCa stands at 3.1% of all new cancer cases, there has been a resistance to an upward change in its survival rate. SCT was also presented as the conceptual framework for the methodological design of this study. In Chapter 1, I also discussed its nature and scope. I also presented the assumptions and limitations that would arise from the use of secondary data and a cross-sectional study design. I also discussed the importance of social change as it relates to PaCa survivors, their families, and their communities at large. Finally, Chapter 1 serves as a bridge to Chapter 2, where I analyze current literature relevant to the study of PaCa survival rate, as it relates to sociodemographics.

Chapter 2: Literature Review

Introduction

During the past decade, the incidence of several types of cancer has declined, with the exception of PaCa. On the contrary, the incidence rate of PaCa had increased precipitously (Nipp et al., 2018). The problem of arriving at an association between non-medical exposures to PaCa and the survival rate, after the development of PaCa, had not been clearly determined by published studies on this subject. As a result of this state, the purpose of this study was to determine if there existed an association between the independent variables (sociodemographics) and the outcome variable survival rate. In this chapter, I provide a review of the literature published within the last 5 years related to the nature and purpose of this study. The use of other references that predate 2010 are of historical value or of theoretical substance that were used to confirm or promote the purpose of this study. The role of the theoretical framework (SCT) chosen as the blueprint for the development of this study was discussed.

In this literature review, I provide evidence of the existing knowledge gap specific to sociodemographics and the part they played in the developmental stages of PaCa. I also determine expected reactions from the dependent variable (survival rate) since an understanding of both the independent variables (marital status, age, education, income and employment) and the dependent variable (survival rate) is based on the literature.

I used several databases for this literature review; and I used Internet searches as the principal mechanism to access these databases. Walden University's Academic Search Premier Databases, hosted by EBSCO have been the main sources. These include

MEDLINE, PubMed, and CINAHL and utilizing the full text option. These sources provided filters/limiting options that custom-made the search according to specific requirements. Key filters were the date of publication for the articles and the assurance that all articles used were peer-reviewed. Other search engines used included Google Scholar for pertinent studies; and Lustgarten Cancer Foundation Archives for current and background information. The SEER program was used for current statistical support.

I used following key terms to procure relevant and current articles for this study. These included *pancreas, pancreatic, socioeconomics, socio-economic demographics, sociodemographics, demographics, survival, cancer, SEER, andenocarcinoma, staged, unstaged,* and *whipple.*

Background

In 2016, PaCa was listed as the seventh leading cause of all cancer related death (Ilic & Ilic, 2016). Deaths from PaCa in the United States alone reached 39,590 (WebMD, 2015a). It is estimated that new cases in 2018 would be 55, 440 (National Cancer Institute, 2018). PaCa as a percentage of all cancer deaths would be 7% (National Cancer Institute, 2016). There are alarming factors. Presently, there is no routine screening test because this cancer is difficult to locate. Moreover, symptoms do not present until the tumor has progressed to an advanced stage (WebMD, 2015b). This means that although overall incidence rates were on the decline during the past 10 years in the United States for most cancer sites, PaCa incidence rate did not experience the same outlook. Some cancer sites that experienced declines in mortality were lung, colon, stomach, rectum, prostate, and cervical cancers, (Mokdad et al., 2017).

Types of treatment currently provided for this type of carcinoma have not shown any remarkable change during the past 10 years. Treatment still relies on four main protocols for persons who have been diagnosed with PaCa, regardless of the stage. These are (a) ablative techniques, most notable of which is embolization; (b) radiation therapy, which is delivered through high-energy x-rays; (c) chemotherapy, often known for its unbearable side-effects; and (d) surgery (American Cancer Society, 2013). Even biomarkers, which seemed to be a useful method in the early detection of other types of malignant tumor, have proven not to be an early diagnostic method for PaCa. This is due to low sensitivity and specificity results from serum tumor markers. Because of this, currently identified biomarkers such as CA 19-9 are ineffective as a diagnostic tool, in the early detection of PaCa (Alderton, 2014; Ganepola, Rutledge, Rutledge, Suman, & Yiengpruksawan, 2014). It is against this backdrop of information that this literature review was conducted with the hope of finding scholarly articles to identify the gap(s) that may exist between the sociodemographics of marital status, age, education, income, and employment, and PaCa survival rate.

Theoretical Foundation

Name and Relevance of Theory

I used the SCT as its blueprint throughout the development of each chapter. I have chosen this theory after carefully taking into consideration the nature of each independent variable (sociodemographics), the research questions, and the hypotheses created because the research variables for this study have moved away from the typical anatomy and physiology of most oncological studies. In other studies, medical treatment, and to a

lesser degree genetic predispositions, have been emphasized. I have, instead, turned to non-medical factors such as social and economic influences, from which to seek associations to the problem. The SCT is grounded on several constructs, but this study will only use four of these constructs believed to best explain the dynamism of demographics. These constructs are: (a) Reciprocal Determinism; (b) Behavioral Capability; (c) Expectations; (d) Self-efficacy.

Origin of Theory

The roots of SCT were originally planted in 1941 when Miller and Dollard proposed a theory of social learning and imitation (Pajares, 2002). It was much later in 1963 that Bandura and Walters built upon the social learning concept with their renowned research into social learning and personality development. This added newer insights into social learning theory, which was headlined with their now famous concepts of observational learning. However, Bandura was dedicated to the idea of expanding his framework of social learning to include the role a person would play in the outcome of his or her behavior. This insight, as it were, gave birth to his 1977 publication of *Self-efficacy: Toward a Unifying Theory of Behavioral Change*. It might be true, however, that one can indeed improve on perfection, because in 1986 Bandura published *Social Foundations of Thought and Action*: *A Social Cognitive Theory*. This was the work that gave rise to reciprocal determinism or reciprocal causation (Figure 1). This view held that all three sides of the triangle — personal factors, behavior, and environmental — were inter-related, resulting in what was sometimes referred to as a triadic reciprocality. Figure 1 vividly showed the influences each factor of the triad exerted on the other two. It was

the dynamism which resulted from this triad that caused Bandura to revise the name of the theory from social learning to social cognitive theory in order to affirm that people's cognition was critical in their ability to correctly perform behaviors that will bring about the needed changes in their lives.

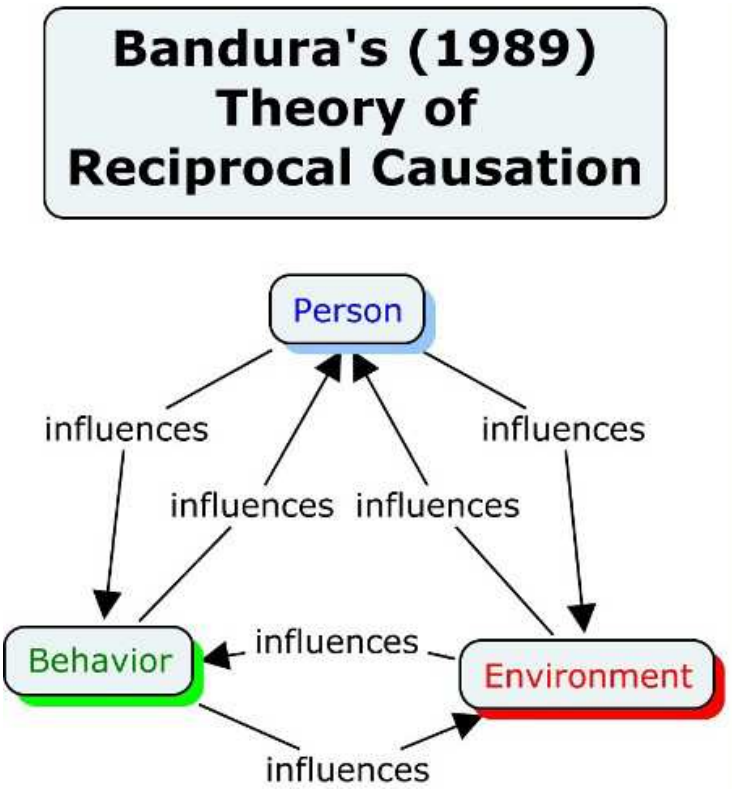

Figure 2. Depiction of Reciprocal Causation, where all three variables are inter-connected.
Note. Figure is used for informational purposes only. No permission is required to reproduce: https://www.google.com/search?q=images+social+cognitive+theory

Assumptions to Application of Theory

For this study, environment, one of the original constructs of the SCT, is considered constant. The rationale is that environment as a factor influences almost all, if not all outcomes of human behavior, whether there are variables from the physical sciences or the social sciences that are being manipulated. Picker (2005), who researched the role of genetic and environmental in the development of schizophrenia, remarked that although the evidence seemed to suggest that whether or not the manifestation of schizophrenia seemed to be the result of a combining of genetic and environmental factors, it appeared that this disorder developed as a result of other factors. This reasoning stems from the belief that no one factor can be significantly associated with schizophrenia. For this study, the belief is that the environment almost, always influences health outcomes..

A similar sentiment was advanced by LaSalle (2012) who declared that while there was the popular belief that autism is a product of two factors, genes and the environment, the defining of, and the arriving at the etiology of autism was too complicated not to believe that there were other unsuspecting factors at work in its outcome. It is this type of logic that supported the idea that the construct "environment" be constant; and treated it as one of the assumptions that must be acknowledged very early in the review, if this theory is to be understood and to be masterfully employed.

There are three other assumptions about learning and behavior upon which SCT rested. One assumption relates to what is called *triadic reciprocality*. This assumption was built on the belief that an individual is directly affected or influenced by two factors,

factors, which in turn are affected or influenced by the person (the other factor). Triadic reciprocality, therefore, operates via a bi-directional mode that involved personal, behavioral, and environmental factors (Denler, Woltrs, & Benzon, 2014). Figure 3 provides a very lucid illustration of *triadic reciprocality*. The other assumption from which SCT finds meaning advanced the thought that people have the capacity to influence the direction in which the environment moves and that, in some way, this direction was driven by personal goals (Bandura, 2001). Denler et al. (2013) added to this thought with their belief that people's ability to influence the environment was because people (given a free society) possessed the ability to influence their own behavior. There is a third assumption, which posits that learning very often is quite independent of a change in behavior. There is the thinking, though, that while both achievements are separate, they may not be entirely exclusive (Denler et al, 2014).

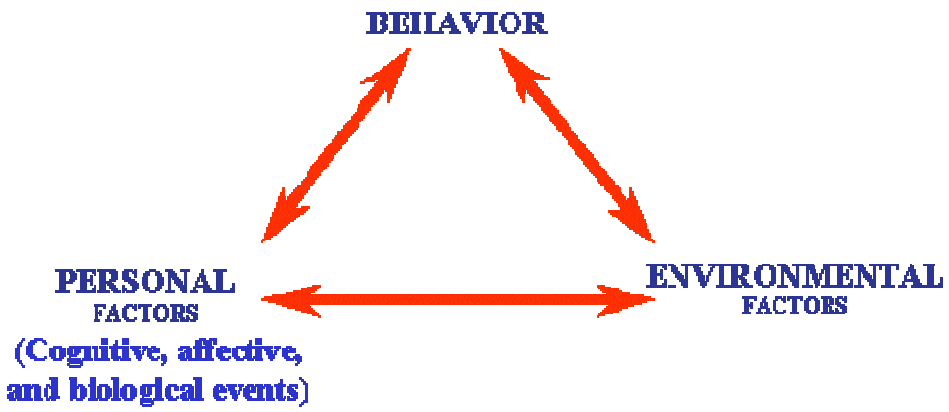

Figure 3. An illustration of the triadic principle of behavior, in which people influence not only their own behavior, but the outcome of the environment.

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Application of Theory to Previous Studies

SCT has been acclaimed to be a very popular theoretical framework, which has been used to inform the development of several public health studies (Rimer & Glanz, 2005). This is because Bandura (1986) was very careful to point out that self-efficacy beliefs are the foundation upon which all of the other constructs sit. It is the assessment of people's abilities to make the correct judgment in order to carry out the required performance that will yield them the desired results (Pajares, 2002). In a study which employed meta-analysis techniques, and which sought to determine the role of SCT in the outcomes of cancer patients, Graves (2003) concluded that SCT-based interventions were intrinsically linked to the quality of life outcomes for adult cancer patients. The embracing of this conclusion was based upon three factors: (a) thirty-eight randomized studies were used with a sample that came from broader population of psychosocial interventions with cancer patients; (b) the results of this integrated studies showed a z score of 3.72, and $P < .01$ (both of high significance); and (c) while not embracing all of Bandura's constructs, the author made use of those constructs that were relevant to the nature and purpose of this study. The constructs chosen were Outcome Expectations, Self-regulation, and Self-efficacy. The researcher of this study noted in the article, that Bandura's work of 1997 indicated that SCT-based intervention strategies were suited not only to individuals, but also for group treatment approaches (Graves, 2003). Bandura's statement seemed to suggest that SCT would be suited for any kind of chronic or infectious disease that would threaten the health of a nation's population.

Miller, Shoda, & Hurley (1996) used SCT as the framework that informed their quest for an association between the outcome of breast cancer as a life-threatening disease and health protective variables. Although this study was published 20 years ago, it is important to consider since the goal of this study is to determine an association between sociodemographics and cancer survival rate using SCT. Miller, Shoda, & Hurley (1996) concluded that there has been an explosion of interest over the past years in researchers trying to understand how people actually dealt with health challenges. In addition, they were interested in the role that these individuals played in their own health outcomes, and the factors that might have affected their roles in these outcomes (Miller et al., 1966). Miller, Shoda, and Hurley (1996) have made it quite clear, that while there were other theories that dealt with the health-protective nature of the problem, SCT dealt with the important elements of self-regulatory expectancies, affects, goals, and values, all of which depended heavily on the self-regulatory aspect of the model. The very premise, therefore upon which that theory was constructed aligns to a very large extent with the way which I have planned my study. This is so not only in the nature of the disease of cancer; but also in the search to identify associations between the disease itself and factors other than medical ones. Such factors can be patient-modifying-behaviors rather than those over which the patient has no control.

A more recent study published by Health Psychology Review adopted SCT from a different perspective. Orr and King (2015) undertook this study in an effort to determine whether SCT would be an effective framework upon which their sought after outcome can be achieved. The authors analyzed health behaviors such as smoking

cessation and the taking of prescription drugs that produced desirable outcomes and determined whether the desired outcome could be achieved by employing specific key constructs of the theory. This meta-analysis used 38 randomized controlled trials that investigated the efficacy of social media, specifically short-message service (SMS) messages. The goal was to determine the extent to which healthy behavior would be practiced by individuals (Orr & King, 2015). The authors looked at the possibility of this study producing valid results simply by them carefully examining the constructs of SCT. They concluded that since their study dealt with behavioral changes, that SMS intervention could be a viable means-delivery-content designed to appeal to peoples' expectations and their self-determination. Moreover, the researchers believed that social cognitive theories could bring about short-term positive change through the interaction of environmental factors and personal behavior. The thought is that this positive change could come about as a result of short-term feedback from these electronic devices. The desired outcomes (health behavioral changes) reported in this article is akin to the outcome in my study. In my study I looked for the constructs of the SCT to provide meaningful effect of the independent variables (sociodemographics) on the outcome variable (survival rate).

Relevance of Theory to Current Study

There are several behavior change theories that have been developed over the past years. These include, but not limited to the Health Belief Model, Theory of Planned Behavior, Transtheoretical Model of Change, and the Theory of Reasoned Action, among others (Glanz, Rimer, Viswanath, 2008). The Social Cognitive Theory, as developed by

Bandura in 1986, however, presented for the first time the notion that human beings are endowed with the capability of affecting various outcomes of their lives, because of certain built-in traits (Pajares, 2002). Bandura's new theory ascribed to the individual qualities that have given him or her the ability to be self-organizing, self-regulating, self-reflecting and proactive in the face of obstacles, perceived or real. In addition, the SCT is one theory that has been effective in bringing about health changes in individuals, especially incremental changes (Orr & King, 2015). This same sentiment was expressed by Rimer & Glanz (2005) who applauded the theory as one of the most widely used theories in which the interaction of personal behavior and environmental factors were important in determining the public's health. The tenets of Bandura's SCT, along with the conclusions reached about the effectiveness of the SCT, have combined to confirm the decision that this is the appropriate theory for the proposed study.

Theory's Broad Appeal to Study Variables

This study seeks to determine if there is an association between each of the independent variables (sociodemographics) and the outcome variable (survival rate). Moreover, this study chose not to use predisposing medical factors such as pancreatitis, diabetes, or Barrett's disease as explanatory variables since the underlining cause of PaCa has not been really understood (WebMD, 2014b). The primary reason for this decision is that the current treatments for PaCa have not moved appreciably beyond radiation, chemotherapy, and surgery. Therefore, the study was designed to find a model that best explained an association between non-medical factors, such as sociodemographics, and PaCa survival rate.

Earlier in this chapter Bandura's theory of Reciprocal Causation was depicted by his illustration of a triad, which showed that a person's behavior was influenced not only by his or her own actions, but by influences of the environment in which he or she dwelled. In a recent study Foster et al. (2015) showed where positive outcomes to this interrelatedness of the patient, the attitude of the patient, and the treatment and care of the patient (environment) can often be achieved through their self-efficacy to manage their present condition. The authors assessed the importance of cancer survivors' self-efficacy to self-manage their situation. This, the authors concluded should become evident within the year following primary treatment, if improved survival rate ultimately is to be gained (Foster et al., 2015).

Another study carried out by Whitaker, Scott, and Wardle (2015) approached the applicability of the SCT to sociodemographics through the framework of *symptom appraisal models,* which seemed to explain how persons interpret or endeavor to make sense of the disease which beset them. The authors also believed that lower income and older age can lead to lower health literacy, which in turn can directly affect the person's knowledge about their health symptoms, treatment, and options, which can then in turn affect their survival rate (Whitaker et al. (2015).

Accordingly, I believe that the SCT moves the conversation about the dismal outcome of PaCa survival rates from mainstream thinking to upstream forward thinking. This can take place when health officials have reached the stage where their planning for the public's health includes the prevention of disease over treatment (DiClemente, Salazar, & Crosby, 2011).

Key Variables and Concepts

In the *Purpose of the Study* addressed in Chapter 1, I indicated that the purpose was to determine to what extent there was an association between each of the independent sociodemographic variables (marital status, age, education, income, and employment) and the survival rate (dependent variable) of PaCa. In my search I discovered that the purpose of many cancer-related studies was not to establish an association between marital status, age, education, income, and employment with the survival rate of PaCa. Those studies which detailed sociodemographics as predictors were interested in the outcomes of other types of cancers, for example, prostate cancer or even breast cancer. Cheung (2013) noted that there was a paucity of data on sociodemographics, which sought to examine their effects on PaCa survival specifically. Part of the author's conclusion was tied to the fact that there was general disappointment about these findings (Cheung, 2013). Moreover, Chueng did not use the same set of demographics which I specified for my research. He omitted marital status, age, and employment as factors that may be associated with the survival of cancer (Cheung, 2013.). Even when sociodemographics were studied for major cancers, including cancer of the pancreas, there was the need for sociodemographic status of individuals to be combined with sociodemographic status of the neighborhood (Chang, Su, , Lai, Huang, Chien, Chang., ... & Lee, C. C., 2012). Given what the literature has presented to date on the independent variables of this study, and their effects on PaCa survival rate, it has become necessary for the literature on these key variables to be discussed individually.

Sociodemographics

Marital Status

Aizer et al (2013) conducted a study in which they examined the effect that marital status had on the outcome of five different cancers: prostate, breast, colorectal, esophageal, and head/neck cancers. After employing a multivariable logistic and Cox Regression analysis to determine the level of association between marital status and the individual cancer outcomes, the study showed three significant outcomes: (1) that married patients were less likely to be diagnosed with metastatic tumors: (2) that they were more likely to pursue therapy that might prove beneficial to them: (3) that the mortality rate for this category of patients did not show any appreciable increase (Aizer, Chen, McCarthy, Mendu, Koo, Wilhite…Nyguyen, (2013). For these five cancers analyzed, the study also showed that marriage seemed to benefit men more than it did to women (Aizer et al, 2013). While married patients who were diagnosed with one of the five cancers seemed to obtain some significant benefits, there were no results from the study to indicate that there would have been the same positive results to patients who were diagnosed with cancer of the pancreas. On the contrary, one of the limitations which the study discussed was that the lack of randomness in the selection of the sample for the study made the results non-generalizable to other cancers not evaluated in this study (Aizer et al., 2013).

Another study looked at certain demographic variables and the part they played in common problems experienced in cancer outpatients. Three variables were studied: marital status, sex, and age. The results showed that these variables seemed to provide to

cancer patients some measure of relief from both practical and psychosocial problems associated with cancer. The study indicated that younger women in a committed relationship seemed to be somewhat insulated from the practical and psychosocial problems associated with cancer diagnosis (Davis, Waller, Carlson, Groff, Zhong, Neri…Bultz. 2012). The conclusion reached, therefore, was that marriage provided some form of prophylaxis against the shock of a positive cancer diagnosis (Davis et al., 2012). While this study provided some indication that there was some association between marital status and cancer outcomes, this was a longitudinal study that followed the same subjects over a 12-month period. The study for my proposal is predicated on a cross-sectional design, where the data for the study population at a given period of time are analyzed.

While much of the literature reviewed on the variable marital status did indicate some association with the study outcome, there is still the gap, according to this study, which showed the need to engage in a study that specifically addressed an association of marital status and PaCa survival rate.

Age

That age should be a factor in almost all cancer studies was made quite evident by the thesis that cancer arises as a result of a single cell becoming mutated. This mutation comes about when this cell experiences a hit in its DNA by other chemical species of exogenous or endogenous origin (Steen, 2000). Oncogenic mutation is at the heart of the changing of a cell, which took place when a perfectly healthy cell is changed to a cancerous cell (Cancer.Net Editorial Board, 2013). According to Goriely & Wilkie

(2012) age had a large role to play in the mutation of genes. This happens in two ways: (a) depending on the age of the individual who is affected with cancer or some other chronic disease; and (b) mutation can take place through the genes of parents who are affected with oncogenetic mutation. In both cases, age becomes a risk factor, since studies have shown that age can cause damage to a gene, which can bring about these mutations (Cancer.Net Editorial Board, 2013; Goriely, 2012).

There was one study that was carried out in Shanghai China, a country from which a sample of 11,672 participants was drawn. The aim of this study was to identify the demographic factors, tumor characteristics, incidence rate, and survival rate of PaCa in urban China; age was one of the factors assessed (Luo, Xiao, Wu, Zheng, & Zhao, 2014). The results of this study showed that younger patients who were at stage one of the cancer, had a survival rate greater than an older person diagnosed with PaCa (Luo et al., 2014). Was it an appropriate decision to select "age" as one of the independent variables with which to determine that an association existed with the survival rate of PaCa? The answer would be yes. This decision was supported by a study released by López-Otín, Blasco, Partridge, Serrano, and Kroemer (2013) which attempted to show the connectivity between aging and human pathologies which included cancer, diabetes, cardiovascular disorders and neurodegenerative diseases (López-Otín, Blasco, Partridge, Serrano, and Kroemer, 2013). The plan is, therefore, that from the secondary data collected, this study would be able to provide some significance between age and survival rate of PaCa.

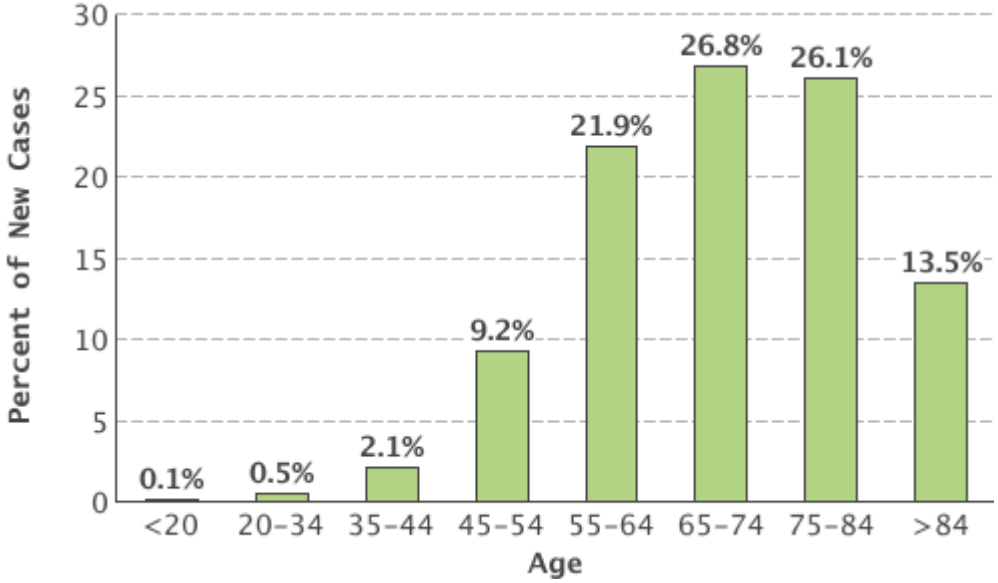


Figure 4. A bar chart comparison of the incidence rate of PaCa for various age groups. Age 55 to 84 is shown to be more vulnerable, with the 65 to 74 age group the most. *Note*. Source is public domain. No permission is required: SEER stat fact sheets: http://seer.cancer.gov/statistics/html/pancreas.html

Education

The point has been made that the mortality rates for certain types of cancer, including cancer of the pancreas, continued to increase among several sociodemographic groups. The different levels of educational attainment can provide a forum for discussion as to whether there is an association between education and the survival rate of PaCa. In a study carried out by Jemal, Simard, Xu, Ma, & Anderson (2012) three levels of education as measured by years of schooling (≤12, 13 – 15, and ≥ 16 as a SES proxy) were gathered from information recorded on death certificates. This recoding of educational information of persons who died of cancer (liver, esophagus, and pancreas) showed that cancer

mortality was greatest in the educational group with less than 12 years of education. It is important to note that the population studied was ethnic-specific (non-Hispanic whites and non-Hispanic blacks comprised the population of study). While the exclusion principle adopted for the variable education limited the generalizability of the results to other populations, it did show that there was still the need for further studies on the association between education levels and cancer outcomes. In another study carried out in Europe on the relationship between educational status and the incidence of PaCa, the researchers concluded that this sought after relationship between sociodemographic status and the incidence of PaCa was inconclusive. Moreover, the results of the study showed that there was no positive association between educational status and the incidence of PaCa (van Boeckel et al., 2010).

The results of this study were in stark contrast to those obtained by Jemal and colleagues. While Jemal et al. (2012) saw that there was an inverse relationship between educational attainment and mortality rate for some of the major cancers, the results of the study carried out by van Boeckel et al. (2010) showed no association between sociodemographic status (including levels of educational attainment) and cancer incidence. What was very note-worthy about the results of the latter study was that, although there was evidence of extensive inequality among the many risk factors as revealed in the European study, there were no statistically significant associations between any of the SES independent variables (age, gender, geographical, and region) and the incidence of PaCa (van Boeckel, 2014). This controversy or mixed findings by the two sets of researchers have presented an opportunity for further research into, not

only sociodemographics, but into all risk factors and their possible association with the survival rate of PaCa patients.

Income

In my reviewing of chronic diseases and the part that sociodemographics played as risk factors in the development of these diseases, it has always been suggested or even determined that income, whether it is designated as household or family income, has a very significant effect on the survival outcomes of various diseases. Kagedan et al. (2016) engaged in a study where they used logistic regression and Cox proportional hazards analysis to determine the relationships between socioeconomic demographic gradients, including patient's median income, and the outcome of pancreatectomy. While other factors such as age, ethnic concentration, and residential instability showed a measure of significance, an association with income was inconclusive. However, Daniel, Barakat, Brumley, and Schwartz (2014) engaged in a study in which their aim was to establish an association between sociodemographics and health-related hindrance of personal health goals of adolescents with cancer. They were able to determine that just as race/ethnicity was significant in persons with cancer pursuing health-related goals, income also played a significant part as to whether or not these individuals would realize their cancer-related health goals. Income, therefore, was determined to be a huge hindrance in cancer patients realizing their health goals. The study showed that those adolescents with higher income reported the most goals, while those with lower income reported goals that were not income-dependent (Daniel et al., 2014).

There was also a study that was carried out in Scotland, in which the researchers sought to determine whether household income was associated with the P53 mutation frequency in human breast tumors (Starks, Martin, Dorsey, Boersma, Wallace, and Ambs, 2013). P53, also referred to as TP53 (tumor protein 53) is a gene that codes for a protein essential in the regulation of the cell cycle (Bates, Phillips, Clark, Stott, Peters, Ludwig, & Vousden, 1998). This gene suppresses cells, and since it is very important for multicellular organisms to suppress cancer, this study became very significant. The results from Starks et al. (2013) showed that human breast tumor patients with household income of <$15,000 had the highest p53 mutation frequency (21%), followed by the group which recorded household income between $15,000 and $60,000 as the next highest p53 mutation frequency (18%). All breast tumor patients whose household incomes were above $60,000 had the fewest mutations, which was 5%. This unique research bodes well for a future study to pursue the establishing of an association between p53 mutation frequency and PaCa.

In 2009, the World Health Organization released information indicating that low income countries recorded higher mortality from diarrheal diseases and HIV/AIDS. On the contrary, people living in high income countries experienced lower mortality from major diseases such as coronary heart diseases, stroke, lung cancer, lower respiratory infections and pulmonary diseases (World Health Organization, 2009). While this study was not cancer specific, let alone PaCa specific, it is Important that I use this literature review to extrapolate the significance of income in that study to any other type of health

outcome. It stands to reason, therefore, that income as a sociodemographic variable could play a part in the survival outcome of all cancers, including cancer of the pancreas.

Employment

Any attempt to determine an association between the independent variable employment and PaCa would lend itself to a review of the death of Steve Jobs, late founder and CEO of Apple. There are two ways in which the variable, employment may be associated with any form of cancer. As a high profile person, Steve Jobs' death from PaCa lent itself to analysis of both. The question, therefore, is asked: Is the type of employment linked to the onset of cancer, or is the type of employment linked to the outcome of quality of life after a positive diagnosis of cancer has been made? Independent of Steve Jobs' position as CEO, and the associated stress levels that went with his position, Steve Jobs developed a pancreatic neuroendocrine tumor, a very rare type of PaCa, which accounts for less than 5% of all cancers of the pancreas (Rowan, 2011).

Employment – Direct Effect

That the nature of Steve Jobs' employment (CEO) can be linked to the onset of his pancreatic disease is indeterminable since, according to American Cancer Society (2015). There are several risk factors of which no one factor is solely associated with PaCa. Recent data showed that age was still a factor; and that the average age at time of diagnosis was 71 years. Gender also presented a risk for cancer of the pancreas, where men are 30% more likely to develop this disease. Race and family history seemed to be associated with PaCa. In addition, genetic syndromes in which gene mutation can be

passed from parent to child seemed to be another risk factor which is also likely to be evident in pancreatic neuroendocrine tumors (American Cancer Society (2015). Steve Jobs' job classification as Company CEO provided him with the kind of resources that proved inadequate, or possibly irrelevant as a risk factor for developing PaCa (Rowan, 2011).

Even when it comes to other occupations, such as those specific to an industrial environment, studies have reported that there is inconclusive evidence about the association between PaCa and types of employment. Brenner et al (2014) conducted a study with the aim of determining whether certain types of employment could produce a measurable kind of risk that would be associated with PaCa. This case-control study was conducted among 826 PaCa case and 930 controls from a European multi-center. The aim of this study was to determine whether physical activity, and hence employment that is white-collar specific (sedentary) versus blue-collar specific (manual) can be determined to be associated with PaCa. Results of the study indicated that there was a decreased risk of PaCa being associated with any kind of physical activity.

Employment – Indirect Effect

While there is no conclusive evidence on a link between employment type and the development of PaCa, studies have been conducted to show that certain types of employment may be associated with differences in job-treatment of persons diagnosed with PaCa, given the age of such a person when this diagnosis took place. This differential job treatment may manifest itself in the survival rate of these cancer patients.

Norredam, Meara, Landrum, Huskamp, and Keating (2009) conducted a study to evaluate the extent to which persons diagnosed with cancer (irrespective of type) were discriminated against in terms of financial status, employment, and insurance access. Park, Park, and Kim concurred in essence with Norredam et al. in that they reminded readers that the Americans with Disability Act (ADA) of 1990 included cancer patients for the same purpose of affording them protection from overt and/or covert discriminatory practices in the workplace (Park, Park, & Kim, 2009). The specific aim of Narredam et al.'s study was to investigate sociodemographic outcomes for those employees who developed cancer, as against those who did not. The conceptual framework that assayed the outcome comprised the following variables: (1) household income; (2) total assets; (3) the patient's net worth; (4) insurance, (5) employment. The egregious outcome which can emanate from all of this is that any change that resulted in employment status due to a positive diagnosis of PaCa, especially if the tumor had been diagnosed as distant or stage four, may lead to job assignment changes, job location changes, or insurance access adjustments. All of these reclassifications could then be translated into the same undesirable result, that is, reduced income (Norredam et al., 2009).

In a recent Danish study on breast cancer conducted by Anderson, Kolodziejczyk, Thielen, Heinesen, and Diderichsen (2015) the results differed slightly from that of Norredam et al. (2009) by showing that reduced income from employment was not associated significantly with the diagnosis of breast cancer (BC). The Danish study ascribed this low significance between sociodemographics and BC to the built-in social

medicine and public income transfers which provided the same payout to all eligible persons, irrespective of differences in earned income. Also, helping to explain the low significance between BC and changes in income after diagnosis is the fact that in the Danish labor sector, private insurance coverage provided a higher level of payout for workers in a higher income bracket (Anderson, Kolodziejczyk, Thielen, Heinesen, & Diderichsen, 2015). This evidence seemed to suggest, therefore, that both types of workers compensation reduced the economic impact that cancer survivors would have experienced from not being able to return to work. While both studies were not designed to determine an association between changes in employment income and survival of persons diagnosed specifically with PaCa, they both provided a platform from which this gap in the literature can be further investigated.

One other indirect effect of employment that may affect survival outcome after a positive diagnosis of PaCa had been made is the age of the employee/patient. According to Narredam et al (2009) two-thirds of all newly diagnosed cancers are found in persons over 55 years of age. This situation is even more greatly magnified for pancreatic cancer, given that the age groups 55-64, 65-74, and 75-84 have all shown precipitous increases. The age group 65 to 74 recorded very significant additions of new cases to the PaCa population. Figure 4 depicts this quite convincingly. It is interesting to note that this study on the age of cancer survivors as it related to return to work (RTW) that was carried out in 2009 is even more relevant now, as evidenced by the recently published study in *Psychosocial Oncology Research.* Recent figures have shown that over 13.7 million persons in the United States are living with some form of cancer. The prediction is for

this figure to rise. This current RTW situation as it pertains to cancer survivors has provided the opportunity for all related disciplines to become involved in servicing the growing needs of cancer survivors. Research in the area of age and cancer survivorship especially, is gaining the attention of both psychological science and evidence-based practice as a means of ensuring that both early survivorship and long-term survivorship are addressed (Stanton, Roland, & Gantz, 2015). The researchers of this study proceeded to suggest, that among the predictors for lower likelihood of returning to work along with limitations on returning to work was older age, which often led to lower socioeconomic status (Stanton et al., 2015).

Any shift in employment that resulted from positive diagnosis of PaCa, regardless of the stage at diagnosis will indeed create the need for further investigation. This investigation should bring into the discussion the importance of employment as an exposure to the survival rate of PaCa patients. This exposure depended to a great extent on the type of cancer that presented itself (Kirkeleit, Riise, Bjorge, and Christiani, 2013). Even more disturbing, should one decide to look at employment and the role it plays in the survival rate at diagnosis, is the fact that the latest figures from the National Cancer Institute disclosed that 52% of all new PaCa cases have been staged as distant, in which the tumor has metastasized, and 10% are unknown or unstaged, as shown in Figure 5 (National Cancer Institute, 2016). The age group shown in figure 4 is that age range of 45-54, when persons begin to seriously think of job stability and job security. It is the age category when workers are less likely to want to change jobs. It is the age group when workers are nervous about the thought of losing their jobs. This is the age when their

skill-set is not very transferable, and the job market (demand for labor) becomes very inelastic (Mansfield, 1985). Given these observations, sociodemographic figures that related to the incidence of PaCa have only served to confirm the importance of the five research questions that will become the foundation of this study.

Several studies have indicated the possibility of employment status impacting the survival outcome of persons who have developed the dreaded disease of cancer. Among these studies was one similar to that carried out by Narredam et al (2009). The purpose in this more recent study was to determine to what extent colorectal cancer patients' treatment and symptom management would play a part in patients work ability and their decision to continue working. Factors taken into consideration were working in a manual occupation, patients' perceived work ability, the nature of their treatment, example chemotherapy. The timelines showed that the decision to work varied but was very much dependent on the duration of treatment and length of time between treatments. The study also suggested that the SCT with its construct of Self-efficacy (the one upon whose framework the study to this proposal rests) should be considered for future analyses of this finding. This self-efficacy might be seen as instrumental in strengthening the resolve of patients who might be called upon to surmount stress and other medical and social challenges just to survive (Bains, Munir, Yarker, Bowley, Thomas, Armitage, & Steward, 2012).

There was yet another study that showed how social support could help to determine the extent to which employment, as a sociodemographic variable, could be associated with survival rate of PaCa. Social support was determined to be multi-

dimensional in nature (Nilsson et al., 2013). It was also important to recall that the environment, one of Bandura's constructs, which spoke directly to the value of the Social Cognitive Theory in health outcomes, could be linked to the social support needed by cancer survivors who returned to work.

Given that employment was classified as a social network and given that the workplace was also classified as a social network, the evidence, therefore, would seem to suggest that employment, ceteris paribus, could provide the kind of social network that would benefit PaCa patients in the workplace. Two conditions governing that outcome were required, however: (1) That the social network should contribute to the overall improvement of the survival rate for pancreatic patients; (2) it was important to ascertain whether the type of support that the return-to-work, surviving cancer patients received from their supervisors and colleagues was received or perceived (Nilsson et al., 2013).

In an even more recent study carried out by Dorland et al. (2015) the authors sought to uncover the nature of the barriers and the facilitators that presented themselves among cancer survivors who were returning to work. In this study the authors concluded that the drawbacks to the proper functioning of cancer patients when they returned to work, even after diagnosis and a protracted time of treatment, came not only from cancer-related symptoms, but also from psychosocial and work-related situation.

Dependent Variable

Survival Rate

SEER expressed survival statistics as the proportion of cancer patients alive at a given point in time, usually 5 years after diagnosis; hence the terminology 5-year survival

rate (National Cancer Institute, 2015). Unless stage of the pancreatic tumor at diagnosis is ascertained, the oncologist is unable to determine the most appropriate method of treatment for the patient. According to the protocol laid out by Cancer Treatment Centers, the survival of the cancer patient begins with prognostic indicators for survival. Figure 5 depicts a very graphic picture on the extent to which pancreatic tumor (one such prognostic indicator) progresses at each stage. Other indicators include, but not limited to the age of the patient, and early resectioning of the pancreas, a surgical procedure that is generally reserved for stage1 tumor detection (Cancer Treatment Centers, 2015). Diabetes and pancreatitis also can be classified as significant prognostic factors, since these medical conditions can lead to an earlier diagnosis of PaCa.

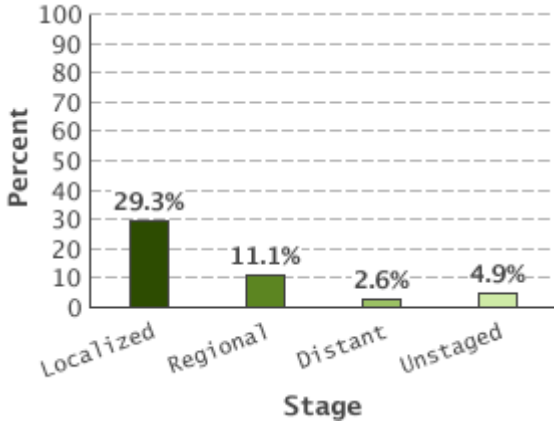


Figure 5. 5-year relative survival: PaCa. For this malignancy, 9.4% are diagnosed at the local stage. The 5-year survival for localized cancer is 29.3% as compared to distant, which is 2.6%. Source is public domain, permission not required to reproduce: http://seer.cancer.gov/statfacts/html/pancreas.html

In a longitudinal study carried out by Shimada, Dakamoto, Nara, Esaki, Kosuge, and Hiraoka (2010) they followed 229 PaCa patients, who underwent surgical resectioning for invasive ductal adenocarcinoma. The results of the study showed that forty patients (17%) survived for more than 5 years. Based on their study and other studies, Shimada et al concluded that 5-year survival is not a cure in and of itself since 16-42% of patients succumbed to recurrent disease from among those who survived for five years. A study by Yu, Baade, and O'Connell (2012) looked at the conditional survival of cancer patients from an Australian perspective. The purpose of this study was to investigate a new concept of cancer survival called conditional survival (CS). This emanated directly as a result of cancer patients' concern about their future chances for survival, after they were able to survive the prognosis in survival years given to them when first diagnosed (Yu, 2012). It is at this point that survival becomes an even greater

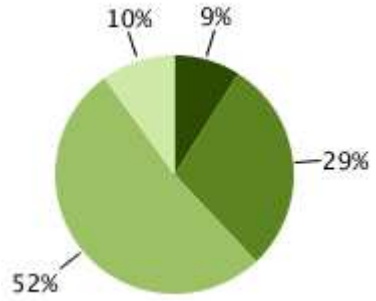
concern for patients, since they have survived the first prognosis in terms of years. This concept of conditional survival is good for continued dialogue among all levels of medical professionals, including public health professionals. The dynamics that have resulted from cancer patients living beyond the predicted time (measured in terms of 5-year survival rate) have provided cancer patients with new expectations. These expectations are in part, based upon other cancer survivors reaching and surpassing similar bench marks in their cancer journey (Yu et al., 2012).

The outlook for improvements to the survival rate of PaCa lies in the work that is being done by the Lustgarten Foundation for PaCa. Much of the reform in methods of diagnosing, treating and prescribing for cancer of the pancreas will come through recent discovery (imperfect though it might be at this time). One such discovery said that PaCa resulted from a series of mutations (mainly the p53 mutation). Dr. Vogelstein believed that it is possible to decode the blueprint for PaCa. Already 63 mutations were found in each of the 24 well-characterized PaCas. The fact that 63 mutations were already found in each of these cancers, lent to the evidence that has already been collected, that all cancers have their beginnings by alterations in the DNA (Lustgarten Foundation, 2015; Fisher, 2011).

Staging as Exploratory Analysis

The stage of a cancer refers to the extent to which that particular cancer had invaded the body (National Cancer Institute, 2015). Surveillance Epidemiology End Results (SEER) defined staging of a tumor by assigning three distinct categories to the tumor's growth progression: (1) Localized or stage 1 is where the cancer has not progressed beyond where it started or sometimes referred to as encapsulated; (2) Regional, where the cancer has moved to the lymph nodes that surround the site of origin; (3) Distant is when the cancer has already spread to other organs and different parts of the body, in which case the cancer has metastasized. The fourth stage has been given several labels in the medical arena. However, according to SEER the progression of the cancer at this stage is a bit shrouded; hence, it is determined to be unknown or unstaged (National Cancer Institute, 2015).

It is the third and fourth stages combined that have provided the magnitude of concern among professionals and lay persons alike. These two stages, together, accounted for 62% of PaCa (National Cancer Institute, 2015). Figure 6 provides a graphical representation of these figures. Knowledge of the stage of the tumor can lead oncologists to choose the right option, which it is hoped will lead to increased survival for the patient.



- **Localized (9%)**
  Confined to Primary Site
- **Regional (29%)**
  Spread to Regional Lymph Nodes
- **Distant (52%)**
  Cancer Has Metastasized
- **Unknown (10%)**
  Unstaged

Figure 6. Percentage of cases by stage of diagnosis: Pancreatic cancer.
Source is public domain**,** permission not required to reproduce:
http://seer.cancer.gov/statfacts/html/pancreas.html

Studies carried out, however, seemed to temper the enthusiasm with which the importance of staging has been mounting. Simard, Ward, Siegel, & Jamal (2012) conducted a study in which they looked at increasing incidence trends of most common cancers, including cancer of the pancreas. While they agreeded that the incidence rate for some cancers is decreasing, the results showed that incidence rates in PaCa were increasing. They concluded that five-year survival for PaCa was poor regardless of the stage at which the disease was diagnosed. In another study Goh, & Yoon (2012) stopped short of labeling the staging of PaCa as ineffective. They are of the belief that the early detection of PaCa is a possibility, but not a reality in most cases. Their reasoning stems

from the fact that prescreening as a testing modality is not currently carried out for cancer of the pancreas.

Their contention is that the identification of high risk individuals was a process that took into account the history of families with identifiable genetic syndromes (Goh, & Yoon (2012). There seems to be some merit in the foregoing argument, since SEER itself has not promoted this type of special procedure. It seems, therefore, that while staging was not a complete tool for the early detection of PaCa, and while 10% of all pancreatic tumors cannot be staged (National Cancer Institute, 2015), staging still remains the only tool at this time that provides medical specialists with a framework for developing PaCa patient care plan.

Summary and Transition

Chapter 2 provided a review of the literature that is related to the purpose of this study. The SCT was described; and discussion about its relevance as the framework for this study was seen as suitable. A short discourse on the origin and development of the Social Cognitive Theory was also provided. Major peer-reviewed studies were reviewed and analyzed. As the literature review progressed, it became obvious that there was a paucity of literature that spoke directly to the variables of interest regarding the disease of PaCa. Analysis of the available literature, therefore, revealed a knowledge gap about each of the independent variables and their association with the dependent variable survival rate. This gap revealed that there was a need to specifically analyze the five socioeconomic demographics to determine if there was an association between them and the survival rate of PaCa.

Each independent variable was analyzed separately in order to isolate the uniqueness of the particular variable upon the outcome. Moreover, the analysis of each variable separately, fed into each research question and its corresponding hypothesis. The review concluded by demonstrating how further research like the *PaCa genome project* that is currently undertaken by the Lustgarten Foundation, could be a factor in changing the way survival rates are now being determined. The literature also indicated that the effectiveness of PaCa staging was severely curtailed because of the unavailability of prescreening capabilities.

In Chapter 3, I present the methodology that used in the discussion of the five research questions for my study, namely: (1) Is there an association between Marital Status and survival rate of PaCa? (2) Is there an association between age and the survival rate of PaCa? (3) Is there an association between levels of education and the survival rate of PaCa? (4) Is there an association between income and the survival rate of PaCa? (5) Is there an association between employment status and the survival rate of PaCa? In this chapter I also discussed the design of this study and the study variables. Given that I used secondary data, I discussed the study population, the sampling method, and all necessary steps and procedures needed for the obtaining of this secondary data. Chapter 3 concluded with the importance of adhering to human subjects' privacy and confidentiality rights as enunciated under the Health Insurance Portability and Accountability Act (HIPAA) of 1996. Quality assurance and all ethical requirements were discussed.

Chapter 3: Research Method

Introduction

I focused on persons 19 years of age and older, who developed PaCa and were surveyed between the years 2009 and 2013. The purpose of this study was to determine whether an association exists between each of the independent sociodemographics variables (marital status, age, education, family income, and employment) and the survival rate (dependent variable) of PaCa. In Chapter 3, I present the research design and the rational for its selection. In addition, I discuss the setting and sample of the population of this study. I also present an inclusion and exclusion criteria when discussing population. The SEER database and cancer registries were the frame of reference for the sections of this study that discussed data collection, instrumentation, and power analysis. I also present other key areas such as research questions, hypotheses, study variables, and power instrumentation that formed part of the research methodology. In the data analysis section of this chapter, I present the statistical test that I used to answer the research questions. The final part of this chapter deals with quality assurance and steps that I took in the study to ensure the protection of study participants. This was demonstrated by ensuring that HIPAA law of 1996, governing privacy and confidentiality of research subjects were observed in every respect. Furthermore, I obtained the approval of all required approvals before the use of any and all imported documentation in this study.

Research Design and Approach

This is an observational, cross-sectional, quantitative study, in which I sought to establish whether an association exists between each of five sociodemographics and survival rate of PaCa. The independent variables were marital status, age, education, income, and employment; and the dependent variable was survival rate of PaCa. Secondary data made possible by the SEER program provided the sample, which was used to analyze the relevant data for this study. Moreover these data were ultimately instrumental in producing the results discussed in chapter 4. The quantitative design for this study was informed by specific frameworks, namely, a cross-sectional observational study, and the SCT.

The main advantage of the cross-sectional study is that I did not manipulate the environment from which this sample was drawn. This element makes this study an observational one, from which, ceteris paribus (all other things being equal), the findings should be a good representation of the entire population (HealthKnowledge, 2011). Added to this is the fact that this study design allowed me the advantage of comparing several different variables at the same time. This augurs well for this study, because there are multiple sociodemographic variables which were observed simultaneously. The net advantage of using a cross-sectional design is that the total cost associated with the production of this study was greatly reduced (Crosby, DiClemente, & Salazar, 2011).

The SCT has been lauded as a theory that is very adaptable to health-related studies. The constructs of this theory seemed to align well with the variables in this study, since arriving at a possible association with a given health outcome was the desired goal

of this study. There are, however, a few drawbacks with the use of a cross-sectional study. It requires the use of a large sample size if at all the results of the study are to be generalized to other populations. In addition, there is the general tendency for responders to health questionnaires/surveys not to give complete and sufficient answers, or even to provide no answers at all. This may lead to bias, unless corrective measures are used through specific statistical tests (HealthKnowledge, 2011).

Setting and Sample

The study population consisted of adults, both male and female, between 19 and 99 years of age who were diagnosed with cancer of the pancreas. There are two main types of neoplasms of the pancreas: neoplasms of the exocrine pancreas and neoplasms of the endocrine pancreas. The vast number of PaCa diagnoses is Adenocarcinomas (75%). This kind of pancreatic tumor emanates from the exocrine pancreas. Acinar cell carcinomas, which account for approximately 20% of all PaCas, also originate in the exocrine pancreas. Tumors arising from the endocrine are less common, and account for no more than 5% of all cancers of the pancreas (Johns Hopkins Medicine, 2012). As a result of this knowledge, it is important to note that for this study there was no differentiation among specific locations of the tumor within the pancreas. Data were collected from the SEER database, which covered the period from 1973 to 2013. This detailing of a specific time period for analysis was critical to the design of this study, which is an observational, cross-sectional one. As such, this study focused on data drawn from a specific period of time.

Inclusion Criteria

The sample for this study consisted of both men and women between the ages of 19 and 99 years, and who had a positive diagnosis of PaCa. The states or regions in the United States of America where the participants resided were not a factor in the sample selection of this study. Therefore, all states as recorded in SEER Registry 18 were included in the study. All participants whose diagnosis and/or mortality records were obtained during this given period were included in the sample for this study. Only participants from 2009 to 2013 formed the study sample.

Exclusion Criteria

Seer*stat recently provided a disclosure with reference to the cut-off-point when using the most currently available expected survival tables. The default censoring age for survival was changed from 119 years to 99 years. The reason provided by SEER was that life tables for ages over 100 years were many times unavailable; and then even if they were available they were at best unreasonable (National Cancer Institute, 2015b). At that time 27 states were not reported in the SEER program, and of those that were reported, the cities of San Francisco and Los Angeles in California were excluded. Also, the city of Atlanta in Georgia was excluded from the SEER dataset.

Research Questions and Hypotheses

The following five research questions seek to determine whether there is an association between each of the independent variables and the survival rate of PaCa.

- Question 1: Is there an association between Marital Status and the survival rate of PaCa?
- Question 2: Is there an association between age and the survival rate of PaCa?
- Question 3: Is there an association between the level of education and the survival rate of PaCa?
- Question 4: Is there an association between income and the survival rate of PaCa?
- Question 5: Is there an association between employment status and the survival rate of PaCa?

Because the question(s) of any study really drive the hypotheses of that study, a separate hypothesis was developed directly from each of the research questions. In chapter 4, after an approval for this proposal was obtained, each of the original hypotheses was analyzed. The expectation was that the null hypotheses would ***not*** fail to be rejected, thus allowing the alternative hypothesis to be accepted. This provided the answer to the problem statement that was outlined in chapter one, and in the *Introduction* to this chapter.

Research Instruments

The data for this study were provided by Surveillance, Epidemiology, and End Results (SEER) program databases. This monitoring program has in place a conventional set of instruments, which SEER has employed for the extracting of information about participants to its program. There are two storing systems from which SEER obtains data for cancer patients; these are "records" and "patient sets." Records data entail medical data that came from reporting facilities, such as hospitals, private and public medical facilities. There is also other follow-up information on cancer patients that come from non-medical organizations (National Cancer Institute, 2015c). A "patient set" is a record keeping system which holds the data that are a consolidation of each patient's records. Included in this patient set are the summarized values of each patient's treatment and cancer stage (National Cancer Institute, 2015d). It is very reassuring to know, especially from an ethical perspective, that when it comes to maintaining the quality of information, there is a dedicated registrar who edits the patients' set fields. This editing is carried out without effecting any changes to the essential values of the patients' records (National Cancer Institute, 2015d).

Study Variables

The approval I obtained from Walden University Institutional Review Board provided me with the authority to access data from Seer*stat databases. The specific dataset that was accessed provided me the occasion to process the following independent variables:

(1) Marital status

(2) Age

(3) Education

(4) Income

(5) Employment

These five independent variables are the factors that were analyzed to determine whether there is an association between each of these independent variables and survival rate of PaCa, the dependent variable. I used these five variables to address the five hypotheses, and simultaneously provide an answer to each of the five questions, which were developed in chapter one of this proposal. The stage of the tumor was referenced only as an explanatory factor. These research questions were also presented in an earlier section of this chapter. Table 2 is a summary of all the independent variables in this study.

Table 2

Independent Variables

Variables	Nature	Type
Marital status	Independent	Categorical
Age	Independent	Categorical
Education	Independent	Categorical
Income	Independent	Categorical
Employment	Independent	Yes/No

Note. Employment, as the act of being employed, rather than the amount of work in a given day, is really what is being associated with PaCa survival rate; hence, the type is Yes/No rather than categorical.

Data Collection

The G*Power calculator (Faul, Erdfelder, Lang, & Butcher, 2007) was used to determine the minimum sample size that was employed in order to test the five hypotheses of this study. This was an *a priori* power analysis. I assumed the following quantities, which were necessary inputs into the analysis: (1) Alpha = .05, Cohens's D effect size of .30, and a pre-specified level of statistical power of .80. These inputs returned a required sample size of 52 participants. Having arrived at the minimum sample size that was required to conduct this study, I independently decided to use the results of the G*Power calculator as a minimum guide only. The principle which guided my decision to opt for a sample size larger than 52 participants came from one of the tenets of a cross-sectional design study. The recommendation was that researchers, who

engaged in study designs of this nature, should always secure a large sample in order to protect the validity of the results.

The solution to the collecting of the most appropriate sample size came through my decision to use archival data as my sample to study the behavior of PaCa's survival rate. The answer to obtaining a sufficiently large enough sample size was provided by the National Cancer Institute, and managed by Surveillance, Epidemiology, and End Result (SEER) program. This program came about as a result of the National Cancer Act of 1971, which mandated that data useful in the prevention, diagnosis, and treatment of all cancer, including cancer of the pancreas, should be collected, analyzed, and disseminated (The Annual SEER Cancer Statistics Review. 2014). It, therefore, was not difficult to make the decision that the most recent population survey for PaCa information released in November 2015 would be used for this study. This most recent data showed a total population of 56,166 PaCa patients of whom data were obtained from 2009 to 2013.

From this population the sociodemographics of age, marital status, education, income, and employment were tested to determine whether there was an association between each of these variables and the survival rate of patients who had been diagnosed with PaCa.

Cox proportional hazard model was used as the statistical test of choice. This test was appropriate for several reasons. First, Cox model is a survival analysis, and as such is quite suitable for observing the time between entry to a study and a later event, such as death (Walter, 1999). Second, the assumption of a constant relationship between the dependent variable and the independent variable can be held constant. Third, Cox

proportional model allowed me to observe the effects of several variables on survival simultaneously. Survival rate for most carcinomas is based upon a 5-year survival of all cancer patients, measured from the point of diagnosis. For a research subject like PaCa, and the fact that gaps in its research had been created as a result of there being no definitive answers to the survival rate problem, Cox proportional hazard model has become a very appropriate statistic in its application.

Data Analysis plan

The five questions which follow sought to determine if there was an association between the five independent, sociodemographic variables and the outcome variable, survival rate of PaCa:

- *Question 1*: Is there an association between marital status and the survival rate of PaCa?
- *Question 2*: Is there an association between age and the survival rate of PaCa?
- *Question 3*: Is there an association between level of education and the survival rate of PaCa?
- *Question 4:* Is there an association between income and the survival rate of PaCa?
- *Question 5:* Is there an association between employment status and the survival rate of PaCa?

The answers to these questions were obtained through the testing of each of the questions that accompanied the hypothesis. In addition, Cox proportional hazard model was the statistical test of choice. SPSS was used to process the archival data obtained from SEER program. Cox proportional hazard model was performed for each of the

sociodemographic independent variables. Survival rate was measured as a categorical variable, and coded as "0" for having reached the 5-year survival rate, and "1" for not having reached the survival rate. Table 3 provides a description of each variable type, its definition, classification, and level of measurement.

Table 3

Tabulation of Variables for Cox Proportional Hazard Analysis

Variable type	Variable name	Classification	Measurement
Independent	Marital status	Single = 1 Married = 2 Widowed = 3	Nominal (categorical)
Independent	Age	<50 = 1 50–70 = 2 71–80 = 3 >80 = 4	Nominal (categorical)
Independent	Family income	≤$50,000 = 1 $51,000 – 64,000 = 2 ≥$65,000 = 2	Nominal (categorical)
Independent	Education	Low = 1 Medium = 2 High = 3	Nominal (categorical)
Independent	Employment	Employed = Yes Unemployed = No	Nominal (dichotomous)
Dependent	Survival rate	5 year = 0 < 5 years = 1	Nominal (categorical)

Note. Low: Did not graduate from high school; Medium: graduated from high school but not college; High: Graduated from college and beyond.

I used four statistics to establish the measures of association between each of the independent variables and the dependent variable. These measures of association are: (1)

Regression coefficient; (2) P-value; (3) Hazard ratio; (4) Confidence interval. This process was carried out by SPSS, a statistical data software that was conveniently able to produce all four of these measures in one output.

I also used the hazard ratio, which many health studies have used to determine an association between the exposure and the outcome of diseases, to establish significance of each hypothesis in this study. According to Bradburn, Clark, Love, and Altman (2003) the hazard ratio is a good tool for measuring the presence or absence of an association between two variables, where the outcome variable is survival time. The outcome expectation for this study was that the hazard ratio statistic would be >1.

The use of Cox proportional hazard model allowed SPSS to produce the confidence level, which as expected contained the true hazard ratio. Given that the confidence level was set at 95%, I was 95% confident that the hazard ratio would lie within the range given by the margin of error. Moreover, since the sole purpose of this study was to establish whether there was an association between the selected sociodemographics (independent variables) and the Survival rate (outcome variable), the expectation was that the results from Cox Proportional hazard analysis would have provided me with a P-value $\leq .05$.

Quality Assurance

The authenticity of Validity and Reliability depends to a great extent on the quality of the data collected, irrespective of whether the data are primary or secondary. To this end the SEER program engages in what can be termed self-regulation of policies and procedures. With SEER, the possibility of making even one wrong decision becomes an

immediate concern. This adherence to standards resulted in the inception of three broad polices by the agency: (1) The completeness of case ascertainment which began in January 1, 1973 is closely adhered to; (2) Close monitoring on the methods used to obtain population estimates; (3) periodic revision of rules, policies, methods, and algorithms to ensure improved quality of all 18 cancer registries, which cover about 28 percent of the US population.

The SEER Result program recognizes that the possibility of errors can always occur in data collection. This can occur because of the dynamic nature of the registries' databases, in which numbers reported in one year for a particular race, sex, age, and cancer category can change from the previous year due to a myriad of reasons, such as code changes occurring when a person dies. Such changes can affect the data on incidence and possible survival (Cancer Statistic Branch, 2014). With the advent of improved electronic monitoring devises, there is now a reduction of errors in data collection and reporting. The responsibility still belongs to the researcher to ensure that the data accessed are protected from any unauthorized persons gaining access to them with the aim of changing or in any way altering the quality of the data. To this end my username and password issued to me by SEER*Stat were not accessible to anyone but the user of record, that is the researcher.

Protection of Study Participants

The responsibility fell on my shoulders to ensure that the use of the databases, which Seer*stat (the managing agency for SEER) provided was in keeping with the purpose for which I obtained them. Moreover, the signing as to my intended uses of these data and

my declaration to safeguard and use these data for the purpose for which I obtained them, compelled me to ensure the privacy and confidentiality of the records of the participants to this study. In addition, all data were de-identified, which provided the added assurance that any unethical practice was essentially eliminated. The signed Limited Use Agreement document which allowed me the privilege of using data from 18 cancer registries was provided as Appendix A. Also, I submitted to Walden University's Institutional Review Board (IRB) an application, which allowed me to officially research archival data from SEER. Once this approval was received, it became part of the requirement for the protection of study participants.

Summary and Transition

Chapter 3 provided readers with the overall methodology and design of this study. Chapter 3 provided the merits of using cross-sectional analysis where the advantages and limitations were discussed. I presented Cox proportional hazard model as the statistical analysis of choice for testing the hypotheses of this study. In chapter 3 I identified the sample, pending IRB approval before the actual accessing of these data. Inclusion and exclusion criteria were also presented. The importance of quality assurance was also treated in this chapter, and the seriousness of obtaining Walden University's IRB approval before starting any research, underscored the awareness of the rights of human subjects. My addressing these research questions served to add to the limited body of research conducted on the still stagnant survival rate of PaCa. The various segments of chapter 3 have provided a prologue to chapter 4, which will present the results of all the statistical processing that have been done through the help of SPSS, a statistical software

package. Moreover, chapter 3 serves as a bridge to both chapters 4 and 5 where the purpose of this dissertation, including the hope for social change can be realized.

Chapter 4: Results

Introduction

The purpose of this quantitative, cross-sectional study was to determine whether an association existed between each of the independent, sociodemographic variables (marital status, age, education, income, and employment) and the outcome variable of survival rate for PaCa. In this study the hypotheses suggested an association between each of the independent variables and the outcome variable, survival rate. In this chapter, I include a description of the data collected, the source of the data collected, and any changes in the size of the population that I reported in Chapter 3. I analyzed each research question using the Cox proportional hazard ratio. I then discuss the results of the analysis for each of the five research questions of this study. The summary of Chapter 4 and the transition to Chapter 5 conclude this chapter.

Data Collection

In this cross-sectional study, I used secondary data obtained from the SEER database. This data base has been well recognized in the United States as the acceptable source for cancer incidence and survival data. This data source also allowed one of the tenets of a cross-sectional study to be fulfilled, that is, the need for a large sample size in order to support validity and reliability of the results (Frankfort-Nachmias & Nachmias, 2008). I extracted the data from the SEER program database, Seer 17 Registry. This registry covered all PaCa cases that were reported between 2010 and 2014. No distinction was made between ethnic groups, regions or nationalities during the analysis of data. The SEER program has defaulted the upward censoring age of the male population at 99. The

most recently released figures (2016) showed that SEER program listed 57, 999 PaCa cases, an increase of 12,256 cases over the previous reported figures in 2015. However, because of the clearly stated number of years that defined the dependent variable (survival time) in this study, it was necessary to revisit the inclusive years that would be used in determining the time period for running the cox proportional regression analysis. Accordingly, the range of years chosen for analysis of this study was changed from 2010 to 2014 in Chapter 3 of this study to 2005 to 2009. This allowed survival to be at least 5 years for each of the cases. After excluding those cases, which did not report any or all of the independent factors for this study, the final number of cases for analysis by SPSS was 41,848.

SEER*Stat collects and publishes cancer incidence and survival data. These data came from the population-based cancer registries. There are 18 such registries that cover approximately 28 per cent of the U.S. population, of which 38% of Hispanics are represented, 44% of American Indians are represented, and 50% Asians and 67% Hawaiian/Pacific Islanders are represented, respectively.

In addition, the case listings used for this study were a very wide representation of many different types of variables that are vital to PaCa survival analysis. It is important to note that while Seer*stat does not collect incidence rates by sociodemographics, these incidence rates, however, are provided by county attributes. As a result, county attributes data from U.S. Census such as median income or educational attainment are still linked to SEER incidence, U.S. mortality and population data by State-County FIPs (Federal Information Processing Standards) codes.

Research Questions and Hypotheses Results

Research Question 1: Results

- RQ1: Is there an association between marital status and the survival rate of PaCa?
    - H_0: There is no association between marital status and the survival rate of PaCa.
    - H_1: There is an association between marital status and the survival rate of PaCa.

I used Cox proportional hazard analysis to test whether there was an association between each of the independent variables and the dependent or outcome variable, survival time. Cox Proportional Hazard Analysis is a very useful statistical test for modelling the time to a specified event whenever the values of the covariates are specified (Bian, 2015). These covariates were essential in predicting the status event. The main statistical output of this test was the hazard ratio. Moreover, I used this statistical test predicated on the already proven assumption. This assumption stated that the hazard ratio comparing any two observations is in fact constant over time, in the setting where the predictor variables do not vary over time (Hosmer, Lemeshow, & May 2008).

One advantage of using Cox Proportional Hazard Analysis is that researchers have the option to calculate survival and cumulative hazards for each variable separately (Statdirect, 2017). Given this facility I have chosen to report the results of each independent variable separately. That being stated, the result of this Cox Regression test between event of interest and predictor variable showed that Marital Status was found to achieve no statistical significance, with a hazard ratio approaching 1, $p > .05$, and 95% CI

= [.903, 1.051]. Therefore, the null hypothesis was not rejected as indicated in Table 4. Further interpretation of all required statistical results was provided in chapter 5 under *Interpretation of Findings.*

Research Question 2: Results

- RQ2: Is there an association between age and the survival rate of PaCa?
    - H_0: There is no association between age and the survival rate of PaCa.
    - H_1: There is an association between age and the survival rate of PaCa.

Age, another of the independent variables, was coded by dummy variables. These represented 4 intervals from < 50 to > 80 years of age between event of interest and predictor variable. The results showed statistical significance with hazard ratio of .474, $p < .001$, 95% CI = [.449, .500]. Therefore the null hypothesis was rejected as depicted in Table 4. Further interpretation of all required statistical results is provided in chapter 5 under *Interpretation of Findings.*

Research Question 3: Results

- RQ3: Is there an association between levels of education and survival rate of PaCa?
    - H_0: There is no association between levels of education and the survival rate of PaCa.
    - H_1: There is an association between levels of education and the survival rate of PaCa.

The results of this Cox Proportional Hazard Analysis where education, another of the independent variables, was coded by dummy variables representing 3 levels of

educational attainment, showed statistical significance with hazard ratio of 1.104, $p < .05$, 95% CI = [1.013, 1.202]. Based on the results of the p value alone, as depicted in Table 4, the null hypothesis was rejected. Further interpretation of all required statistical results was provided in chapter 5 under *Interpretation of Findings.*

Research Question 4: Results

- RQ4: Is there an association between income and the survival rate of pancreatic cancer?
    - H_0: There is no association between income and the survival rate of PaCa.
    - H_1: There is an association between income and the survival rate of PaCa.

Income, another of the independent variables of this study was coded by dummy variables representing 3 levels of income: 1 = low, 2 = median, and 3 = high. The results of this Cox Proportional Hazard Analysis between event of interest and predictor variable showed statistical significance with hazard ratio of 1.056, $p < .05$, 95% CI = [1.006, 1.107]. Based on the results of the p value alone, as depicted in Table 4, the null hypothesis was rejected. Further interpretation of all required statistical results was provided in chapter 5 under *Interpretation of Findings*.

.**Research Question 5: Results**

- RQ5: Is there an association between employment status and the survival rate of PaCa?
    - H_0: There is no association between employment status and the survival rate of PaCa.

- H_1: There is an association between employment status and the survival rate of PaCa.

Employment status, another of the independent variables of this study, was measured dichotomously. The cases were classified as *yes* employed or *no* unemployed. The results of this Cox Regression analysis showed statistical significance between event of interest and predictor variable with hazard ratio of 1.139, $p < .05$, 95% CI = [1.014, 1.281]. Based on the results of the p value alone, as depicted in Table 4, the null hypothesis was rejected. Further interpretation of all required statistical results was provided in chapter 5 under *Interpretation of Findings*.

Table 4

Variables in the Equation

Variables	B	Sig	Exp(B)	95% CI
Marital status	-.026	.504	.974	[0.903, 1.051]
Age	-.747	.000	.474	[0.449, 0.500]
Education	.099	.024	1.104	[1.013, 1.202]
Income	.054	.026	1.056	[1.006, 1.107]
Employment	.130	.029	1.139	[1.014, 1.281]

The SPSS Case Processing Summary Table is a very significant output in that it capsulizes the answers to the research question in this study: Is there a relationship between a given set of sociodemographic independent variables and the survival time of 5 years? Table 5 shows the population divided into two categories – the event, which is categorized as attaining 5 years of survival; and censored, those cases that failed to attain the 5-year mark. The number of cases that reached the event was 2,416 or 5.8% of all cases; and the number that did not experience the event was 39,432 or 94.2%

Table 5

Case Processing Summary

Cases	*N*	Percentage
Event	2,416	5.8
Censored	39,432	94.2
Dropped	0	0
Missing	0	0
Total	41,841	100.0

Note. Event = dependent variable: survival time attained; Censored = before the earliest event (survival time not attained).

Summary and Transition

This study examined if there was an association between each of the five independent variables (marital status, age, education, income, and employment) and the dependent variable (survival time) measured as 5 years. A justification was provided for the use of Cox Proportional Hazard Model as a suitable statistical test for this analysis. No association was noted between marital status and a patient surviving 5 years after diagnosis. Therefore, the null hypothesis was accepted. An examination of the other independent variables was made for the same reason, and they were determined to be statistically significant. Therefore, the null hypotheses associated with these variables were rejected.

Chapter 4 presented the results of this cross-sectional study, which sought to determine if there was an association between marital status, age, education, income, and employment, with reference to PaCa 5 year survival. Chapter 5 positions the findings of chapter 4 within the context of the proposed theoretical framework. In this chapter I also present the strengths, limitations, as well as recommendation for future research. Chapter 5 concludes with suggestions as to how the findings from this study can provide opportunities for stakeholders to develop agendas in the future, with the hope of bringing about positive social change.

Chapter 5: Discussion, Conclusion, and Recommendations

Introduction

The purpose of this quantitative study was to determine whether an association exists between the independent variables (marital status, age, education, income, and employment) and the outcome variable, survival rate of PaCa. This was a cross-sectional study, in which I analyzed a total of 41,848 PaCa cases as reported by the SEER Program. Current studies have not been able to establish a definite association between sociodemographic independent variables and outcome variable, survival rate. Through this study I addressed this gap by analyzing a given population that was diagnosed with PaCa. The period of the case listings was from 2005 to 2009.

The results of this study revealed that there was a strong significance between age and the survival of a person diagnosed with PaCa. The results were not that robust for each of the independent variables income, employment and, education. The results, however, had one thing in common for each of these variables. There seemed to be an inverse relationship between the level of income and survival rate, the ability to be employed and survival rate, and the measure of education and survival rate of PaCa. Marital status was not determined to be even mildly associated with the survival rate of PaCa.

Interpretation of the Findings

Several studies have been conducted on PaCa, mainly on its diagnosis, morphology, and prognosis. Limited work has been done on the direct association between sociodemographic factors and the survival rate of this disease. Even when studies attempted to examine such association between sociodemographic variables and survival rate of PaCa, their analyses had not been carried out with the use of large sample sizes. The use of a large sample is one factor that has made this current study unique and appealing. There was one study in particular conducted by Tramontano et al. (2017) that sought to establish a relationship between sociodemographic variables and survival outcome of pancreatic adenocarcinoma. Although the purposes of both studies were different, there was a similarity in the outcome of age as an independent factor for both studies. Both studies showed that there was an inverse relationship between age and survival. Although the results of that study did show a relationship between age and the survival rate of PaCa, those results depended on other covariates such as demographic, clinical, treatment disparities, staging, and treatment options.

The purpose of my study was solely to determine whether there was an association between five independent variables: marital status, age, education, income, and employment. Moreover, the sample size used for this current study, which was more than twice that of the 2017 study, minus the varied types of confounding variables used by Tramontano et al, (2017) promoted the uniqueness of my study in arriving at a similar outcome.

The total number of cases analyzed by the IBM software SPSS for this study was 41,848. The literature showed that there were studies that sought to establish a causal relationship between one or more independent variables and the outcome variable, survival time (Yadav, 2013). The interest displayed in such research was not to engage in a study where the independent variables were determined to have an association with the dependent variable for its own sake. Those studies were undertaken with the goal of obtaining correlations between a given set of covariates. My study is even more relevant, since the literature revealed that whenever a study was done to establish an association between independent variables and survival rate of PaCa, such study was carried out mainly between non-sociodemographic variables, such as anatomical and physiological conditions. Diabetes and pancreatitis, as an example, are two very prominent conditions, which are often analyzed to determine their possible association with PaCa (Yadav, 2013). This current study brought out its uniqueness by my seeking to establish only an association between each of the sociodemographic independent variables, marital status, age, education, income, and employment and the outcome variable, survival rate.

Marital Status: A Sociodemographic Variable

For Research Question 1, I simply asked if there was an association between marital status and the survival rate of PaCa. The results from the analysis showed that there was no statistical significance. The hazard ratio approached 1. The actual measure was .974. Within the context of the independent variable (marital status) this indicated that there is no likelihood of this variable having any meaningful association with the survival outcome of any patient who had been diagnosed with PaCa. In addition, the

confidence interval associated with this hazard ratio statistic was [.903, 1.051]. This confidence interval was narrow, leaving one to conclude that the estimated amount of non-significance was relatively precise. This is even more so, if one is pinning the survival time of the population that was diagnosed with PaCa to the standard survival time of 5 years. The output also showed that $p > .05$. The null hypothesis in this case could not be rejected, thereby allowing me to conclude that there is no association between marital status and the survival time of PaCa.

A study conducted by Aizer et al (2013) showed a contradiction of sorts between the results of that study and this current one. That study showed that the likelihood of married patients to be diagnosed with metastatic tumors was reduced and that there was no increase in mortality rate. However, this discrepancy might very well be due to the fact that Aizer's study was carried out between the independent variable marital status and five other different cancer types (prostate, breast, colorectal, esophageal, and head/neck). Moreover, the analytical tools (multivariable logistic and Cox Regression) although similar, were not identical. There was also the lack of randomness cited in the limitations of that study, which might have accounted for the difference in results.

Another study carried out by Shi et al. (2016) indicated an association between marital status and outcomes of other factors besides PaCa. While these results contradicted the findings of my study, they only serve to support the importance of this study in continuing the conversation on the part that marital status would play, if an association were to be established. This cross-sectional, quantitative study is the first to analyze the association between each individual, socio-demographic variable and the

survival rate of PaCa. As a result, this study should be added to the body of literature that catalogs the association between sociodemographics and PaCa survival rate. In so doing, discrepancies with the results of similar study variables such as marital status might be eliminated.

The (SCT) was used as the theoretical framework for this study. Its suitability is due to its acceptance as a model for research in multiple areas of public health (Denler, Wolters, & Benzon, 2014). There were four constructs; each was aligned to the analysis of each research question.

The first research question sought to determine if there was an association between marital status and the survival rate of PaCa. The results of research question 1 showed that there was no association between marital status and a patient's chance of attaining five years of survival after a positive diagnosis of PaCa. The theoretical construct (reciprocal determinism) calls for a patient's ability to interact with others within the environment through social contacts. The environment of marital status, in response to the research question 1, showed no possibility that reciprocal determinism as a construct will positively impact an association between marital status and the survival rate of PaCa. These results from research question 1 were also supported by Sheer et al. (2014) in their research into marital status, as a factor in the survival of adjuvant treated PaCa. Accordingly, the evidence suggested that the construct, reciprocal determinism has validated the results of research question one.

Age: A Sociodemographic Variable

For Research Question 2, I simply asked if there was an association between age and the survival rate of PaCa. Age, one of the independent variables, was coded by dummy variables representing 4 intervals from < 50 to > 80 years of age. The results of this Cox Proportional Hazard Analysis showed that there was statistical significance between Age as the independent variable and PaCa survival time, the dependent variable. The hazard ratio (the key statistical output for a cox proportional analysis) showed statistical significance with hazard ratio of .474. According to (National Cancer Institute, n.d.) a hazard ratio of greater than one or less than one means that survival was better in one of the groups. Age as an independent group has been known to be associated with rate of progression in almost all chronic illnesses and other types of morbidities. The uniqueness of age is such that there is an inverse relationship between it and survival, that is, the higher the age of a person who has been diagnosed with a chronic disease such as PaCa, the lower the chance of his or her survival time (Yadav, 2013).

In one of several studies conducted in the past Cancer.Net Editorial Board (2013) revealed that Oncogenic mutation is at the heart of cell changes, changes of which, very often resulted in cancerous cells. It was Goriely & Wilkie (2012) who expanded on the theory of mutated genes by citing age and parental genes as risk factors in the proliferation of cancerous cells. These two earlier findings supported the results of this study that there was an association between age and PaCa. Although the earlier two studies were not carried out on PaCa, they provided a strong measure of validity to the independence of this study; and suggested that age is also a factor of the survival rate of

PaCa. Moreover, the confidence interval associated with the hazard ratio is narrow, allowing one to conclude that there is a high level of confidence, say 95%, that there is an association between age and PaCa survival time.

There was one study that was carried out by (Luo, Xiao, wu, Zheng, & Zhao, 2014) in Shanghai China. This study indicated that younger persons with stage one PaCa experienced a better survival rate. It is important to note that while the earlier study and this current study shared similar outcomes, the earlier study was conducted under a strikingly different set of conditions from this current one. The earlier study used a sample of 11,672 participants, far fewer in numbers than this current study. The earlier study specifically controlled the geographic region from where the sample would be drawn, which was an urban district of China; and age was used as a confounding factor rather than an independent factor for PaCa.

Based upon the uniqueness of my current study, it is safe to say that, should this analysis be repeated with similar populations the results should be the same; hence validity would be assured. Moreover, based upon the results of this current study it is also safe to say that an association between *age* and PaCa does exist. We can further infer that the younger the individual, the better the chance of attaining the survival time of five years; the older the individual the less likely there is the chance of experiencing survival time to five years.

The second research question, age, was connected to the SCT construct, *Reciprocal determinism*. This construct posits that the three elements of personal, environment and behavior work interchangeably to affect the outcome. Reciprocal

determination has to do with behavioral change. Age can affect a person's behavior, which in turn can affect the environment, which can in turn affect the person. The reciprocal trait of this construct is responsible for the patient being ultimately affected by the sociodemographic factor, age. The fact that the results of question 2 showed age as having an association with the survival rate of PaCa speaks to the importance of this construct to the study.

Education: A Sociodemographic Variable

For Research Question 3, I simply asked if there was an association between levels of education and the survival rate of PaCa. For the Cox Proportional Hazard Analysis, education, one of the independent variables, was coded using 3 levels of educational attainment. The result showed that the hazard ratio for education was 1.104. A value < 1 tends to be accepted as the independent variable having little or no effect on the outcome variable, while a value > 1 has the opposite effect of establishing that the end point or event has been achieved by the population. Since for this study survival time is the end point or event, it may be safe to assume that the higher the educational attainment of a person diagnosed with PaCa the better the chance of him or her experiencing a survival time of five years. The p-value of .024 also supported the conclusion that the null hypothesis should not be accepted, that the outcome is significant, and hence there is an association between different levels of education and survival rate of PaCa.

Jemal, Simard, Xu, Ma, and Anderson (2012) carried out a similar study in which three levels of education measured by years of schooling were used to determine in which

educational group mortality among liver, esophagus, and pancreas patients was greatest. While the results showed that highest mortality occurred in the group with less than 12 years of schooling, it should be classified as inconclusive since unlike my study, that study limited its survey to two specific ethnic groups only. This recent study surveyed case listings from more than 27 different states, with no ethnic-exclusion factor considered. Two similar studies carried out by two independent researchers produced dissimilar results. Jemal et al. (2012) obtained results that showed an inverse relationship between educational attainment and mortality, which was more in keeping with the reasoning advanced from the result of this recent study, On the other hand Warner et al. (2015) showed no association whatsoever between any kind of sociodemographic status, which included educational attainment, and cancer survival. The results of the present study, which showed that there is an association between educational attainment and PaCa, have presented a ready opportunity for it to be included among the current body of literature. This step could allow *educational attainment* to be regarded as one sociodemographic variable that might be worthy of serious, further investigation.

Research question 3 asked the question if there was an association between education and the survival rate of PaCa. The results of $p < .05$ showed there was an association between the independent and dependent variables. This result aligned very neatly with the construct *behavioral capability*, in that it also showed that the desired result or outcome would be very much a condition of the patient's ability to affect the outcome by being a part of the decision making. This decision making, however, is concomitant on the patient having acquired the appropriate skill-set or attained the

educational level that would render him or her capable of being part of the decision making, which could directly influence the survival rate of PaCa. A very important study was conducted on cancer survivors' perceived need for supportive care and their attitude towards self-management and health. This study has lent credence to the importance of the construct, *behavioral capability*, in patients' recovery. In so doing it has supported the results of my study that there is an association between education and the survival rate of PaCa. The results of that study indicated that patients' positive attitude towards their health in general was associated with their age, income and education, specifically higher education (Jansen, van Uden-Kraan, van Zwieten, Witte, and Verdonck-de Leeuw (2015). These findings have definitely tied this construct of the theory to the results.

Income: A Sociodemographic Variable

For Research Question 4**,** I simply asked if there was an association between income and the survival rate of PaCa. Income, one of the independent variables was also coded to represent three levels of income (low, medium, and high). The results from the Cox Proportional Hazard Analysis showed that the hazard ratio for income was 1.056. As it was with the results for education, a hazard ratio for income greater than 1 will also indicate that the end point or event by the population has been reached. In addition, as it was with the results for education, survival time is the end point or event in this analysis of income. Therefore, it may also be safe to assume that the higher the family or household income available, especially that of disposable income, the higher the lever of association that may be detected between income and PaCa survival time. It must be borne in mind that survival time has been defined as 5 years post diagnosis for this study.

Arriving at this conclusion about the hazard ratio output seemed to be supported by the results of the p-value, which was .026. This result of the p-value allowed me to conclude that the outcome is significant, and that the alternative hypothesis that there is an association between levels of education and survival rate of PaCa, should be accepted.

Two earlier studies, however, presented dissimilar results from similar studies on the association between various sociodemographic variables and cancer mortality, specifically the survival outcome of this disease. The results of a logistic regression analysis by Park, Park, Choi, Jun, and Lee (2011) showed that while other sociodemographics factors produced significant associations between these study variables, income did not. On the other hand a similar study conducted by Daniel, Barakat, Brumley, and Schwartz (2014) showed that income was determined to be a huge health benefit. However, despite the dependent variables for both of these studies were factors other than the survival rate of cancer mortality, their results have surely strengthened the importance and value of my study; and have also ensured its place in the continued discussions of PaCa survival rate.

Research question 4 sought to determine if there was an association between income and the survival rate of PaCa. The results of this study also indicated that there was an association between income and the survival rate of PaCa. As it was with the outcome of the variable age, income was aligned with the same construct, reciprocal determination. The difference is that the dynamics of income is such, that the higher the level of income, the better the opportunity for the three elements of this construct (environment, behavior and the person) to interact in the achieving of the desired goal.

Income can affect the person, who can then affect behavior, which may then in turn affect environment. Environment will always in turn affect the person. The environment of higher income may indeed affect the person's decision making to change the environment necessary to increase the survival rate of PaCa. This thinking is supported by a study carried out by Kagedan et al. (2016) that saw higher income as a means of providing patients the opportunity to obtain the much needed adjuvant therapy, which currently is the most recommended treatment in the survival of patients with PaCa. The construct behavioral capability has therefore informed the discussion of the fourth research question.

Employment: A Sociodemographic Variable

For Research Question 5**,** I simply asked if there was an association between employment status and the survival rate of PaCa. For the Cox Proportional Hazard Analysis, I measured employment dichotomously, where cases were classified as *yes* employed or *no* unemployed. The results showed that the hazard ratio for employment was 1.139. As with the results for education and income, this would indicate that this independent variable had exerted some effect on the population reaching the end point or event. Again, as it was with the results for education and income, it may also be safe to assume that the survival time of 5 years for a person diagnosed with PaCa may be associated with the ability and opportunity for that patient to be gainfully employed (*yes*) or not gainfully employed (*no*).

The conclusion that there is an association between employment and survival rate of PaCa is supported not only by the results of the p-value, which was .029, thereby

allowing the null hypothesis not to be accepted, but by the results of three studies in particular. Kirkeleit, Riise, Bjorge, and Christiani (2013) reported that while employment did seem to offer an exposure to the survival rate of PaCa, this association was predicated upon the type of cancer that presented itself. Bains et al. (2012) while agreeing that employment had some connectivity to survival rate of cancer, regardless of the type, seemed to incorporate *social support for cancer patients* with any association between employment and the mortality rate of cancer.

Even though Nilsson et al. (2013) study reached back to the SCT and linked self-efficacy to an association between employment and cancer mortality, their study, along with others still did not find complete alignment with mine. One other such study, Dorlan et al (2015) sought to connect the *nature of barriers* and *the facilitators* to those barriers, with the association between employment and cancer mortality. Stanton et al. (2015) saw age as a confounding variable which could help to explain any connectivity between employment, the independent variable, and the survival rate of cancer. Conversely, Anderson, Kolodziejczyk, Thielen, Heinesen, & Diderichsen (2015) in their study endeavored to link *workers compensation* to any association between employment and the survival rate of cancer. Those findings have strongly indicated that my study, which seeks to establish an association only between education and the survival rate of PaCa, merits its addition to the current body of literature. In so doing further studies on establishing this association between employment (only) and the survival rate of PaCa can be entered into.

In research question 5 I asked whether there was an association between employment and the survival rate of PaCa. *Behavioral Capability*, one of the constructs of the SCT became very relevant to the interpretation of the results. As mentioned in chapter one of this study, this construct described the behavior patterns of patients, who can answer *yes* or *no* to the question of being employed. There is always dignity in being employed, and dignity gives one the behavioral capability of becoming part of the healing process. Bjorkenstam, Alexanderson, Bjorkenstam, Lindholm, and Mittendorfer-Rutz (2014) conducted a study in Sweden where they examined the association between disability pension and subsequent mortality. They concluded that the inability to be gainfully employed might be one of the factors that could be associated with higher mortality rate. It may be safe to conclude that the construct Behavioral Capability has supported the results of research question 5 that there is an association between education and the survival rate of PaCa. The effectiveness of patients' behavioral capability would, therefore be a function of their own individual educational level as analyzed in chapter 4.

Just as the five independent variables depended on the theoretical role of the first three constructs, the dependent variable, survival rate depended to a large extent on *Self-efficacy* (the fourth construct). It is the will or the desire of the person that often brings about the desired result. That this concept brought effectiveness to the results of this study was illustrated in the ***triad principle of behavior*** in Chapter 2, which showed the inter-relatedness of the person, behavior, and the environment. The results of this study further served to validate the suitability of this theory to the interpretation of the results for each research question analyzed in chapter 5.

Limitations of the Study

This study sought to determine whether or not there was an association between each of five independent variables and the survival rate of PaCa. The data source for this study was through the courtesy of SEER program. This type of data, secondary data, has many build-in weaknesses or biases. The first one is the collection of the data itself, which removed control from me, as to how the actual method for collection of data was designed. Any type of apprehension on my part, in terms of biases was readily removed, since I had the assurance from SEER program that all necessary safeguards were in place to protect the quality and integrity of patients' health information. In addition, the University's Institutional Review Board's (IRB) policies provided another layer of safeguard against unscrupulous handling of data.

On the matter of incompleteness of patient information, and the chance of producing invalid results, I ensured the reduction of these possibilities through the very large sample that was placed at my disposal from the SEER program – 41, 848 to be exact. This was the final number after all subtractions and exclusions were made. In addition, SEER's most recent data release years was 2014. However, in order to obtain the largest sample size possible, and yet remain relatively recent with PaCa case listings, I made the necessary adjustment in terms of the range of years that would allow the study to account for a survival time of 5 years as detailed in the study's research questions. Another concern with SEER available data was the fact that SEER does not report sociodemographic data on its cancer patients. I was able to supplement this deficiency, since such data are collected by the counties and are made available to SEER.

Given this was a cross-sectional, Quantitative study, the aim, therefore, was not to analyze the nature of PaCa or to determine if there was a causal relationship between the independent variables and the dependent variable, survival rate. Whatever limitations that might have emanated from the use of secondary data, were nullified through SEER Quality Improvement System. This system is an integral part of the SEER program, and is committed to ongoing, quality control studies and periodical data assessment (Cancer Statistic Branch, 2014). In addition, as a result of the large sample size of this study and the very well documented safeguards in place for procuring cancer patients information, the side effects of seeming limitations are reduced. These safeguards, which I have attested to by my signing of a user-agreement, assured readers of the validity and reliability of this study should it ever be put to the test.

Recommendations

PaCa is an insidious disease with a dismal prognosis. The results of this study have provided new information on each of the five independent variables and their separate association with the survival rate of PaCa. Since the results showed no significance between marital status and PaCa survival rate, it behooves researchers to engage in further research, possibly using differently designed forms of measurements. This may be necessary because marital status has been undergoing fundamental changes in the definition of what constitutes a family. Future studies, given different parameters, may yet result in marital status exhibiting some form of association with the survival rate of PaCa.

Results of the other 4 independent variables may provide impetus for further research. This type of future research may be carried out in terms of how the changing nature of the workplace in this highly technological era can impact employment. This type of employment change, including job specification, may prove to be advantageous to persons with certain chronic diseases, including PaCa. This redefining of job specifications may impact decision making on the health of employees in general, but especially on the long term effect that these new jobs could have on the risks of workers acquiring malignancies, especially tumors of the pancreas. A specific recommendation is for research to be undertaken, linking PaCa, gastroenteritis and any specific type of employment exposure. The fact that only 5.8% of the sample studied actually survived to 5 years does send the message that much work remains to be done. This work should be in the researching of new areas that may possibly provide an association with PaCa survival rate.

The results of this study should be made available to Long Term Care facilities, such as nursing homes and nursing centers where the population is aged. Given that this study showed a positive relationship between age and PaCa, nursing home facilities could provide a ready population for further research. This recommendation is also extended to cancer funding organizations such as Sloan Kettering to engage in further studies on all of the remaining four sociodemographic variables (age, education, income, and employment) to determine in what way the association of each independent variable revealed in this study can influence PaCa survival rate. Finally, epidemiologists of various State Health Departments should buy into the importance of engaging in further

analysis of various forms of sociodemographics, and their impact on the survival rate of PaCa.

Implications for Social Change

PaCa is an attention-getting health concern with an estimated 64,668 persons living with this disease in the United States of America (Ries et al., 2017). With this knowledge this study has implications for social change in several ways. It adds to the body of literature that already exists in the search for connections between PaCa and its survival rate. This study has also brought in an awareness of different alternative factors that can be associated with the survival of patients, who have been diagnosed with PaCa. In essence this study has moved away from the traditional medical and genetic factors that have been held to be associated with the survival time of PaCa, and is giving attention to those factors (generally referred to as sociodemographics) that are the very essential areas of a person's daily existence. The uniqueness and potential for this study to initiate social change stem from the fact that it is the only study that produced specific results on the association between each of the five independent, sociodemographic factors and the survival rate of PaCa. This underscores the individual importance of each associating factor.

This current study deals with a pleading need for the discovery of risk factors other than adjuvant therapy. It also underscores the thesis that risk factors, especially sociodemographic ones, impact the level of well-being that pancreatic patients experience. A review of the theoretical framework of this study reminds readers that environment plays an important role as a risk factor in the survival of all cancers,

including, PaCa. The realization of the seriousness of cancer as a terrible disease, which requires innovative measures in order to bring about social change is not a new idea. In their study, Cella, Hahn, and Dineen (2002) called for meaningful change which they emphasized was a required factor for effective decision making. They noted that all health personnel should become more proactive when it comes to health related quality of life for cancer patients. Their study emphasizes *change* as it relates to decision making with regard to treatment options. Till, Koren, and Rovert (2008) came to a similar conclusion in their study, in which they noted that there was much work to be done by occupational health researchers and policy makers if all forms of chronic diseases are to be prevented. During the last sixteen years several studies have concluded that there was much work needed in the prevention of cancer if the affected population is to experience positive social change. Pietrasz et al. (2017) in an effort to contribute to this social change occurrence that is sorely needed in the area of PaCa undertook a study to determine how plasma circulating tumor DNA in pancreatic patients may be used as a prognostic marker. The purpose of that study supported the need for social change to become a reality. It also confirmed the need for the results from my study to be embraced by all practitioners of human behavior. The conclusion made by Pietrasz et al. (2017) that despite recent therapeutic advances, there has been no remarkable progress in the prognosis of patients diagnosed with PaCa, strengthens the need for studies like this current one to be undertaken.

In 2018 the records continue to show that there is still the need for additional studies; and for their results to be seriously adopted if social change is to be realized. This

is important so that individuals and institutions can be in a position to embrace the call for social change in the health field in general, but specifically in the area of PaCa. When there is an understanding about the factors that are associated with a specific disease, public health practitioners, healthcare providers, and influential stakeholders would be better able to develop agendas for future action in their determination to conquer this disease. In so doing the element of hope and the expectation for longer and more productive survival time for those diagnosed with this disease could become a reality. This upstream way of thinking could only result in a better quality of life for the patients, their families, their immediate neighborhoods, and the nation as a whole. Globally, lives may also be changed.

Conclusion

PaCa is a disease that is very difficult to diagnose. When an individual is eventually diagnosed with this disease it is usually at the stage 4 level. To date, the best chance for a person diagnosed with this disease to attain to the 5 year survival rate is for positive diagnosis of the disease to be made at the very early stages of the tumor's growth (National Cancer Institute, 2015; Cancer Treatment Center, 2015). Given that new cases of PaCa for 2018 are projected to be 55,440, it behooves researches and health practitioners to develop more urgent, aggressive, and imaginative approaches to the developing of PaCa studies. This is even more compelling when seeking to identify factors that were never before explored.

This quantitative, cross-sectional study analyzed data from 2005 to 2009 with the expressed purpose of determining if there was an association between the

sociodemographic independent variables of age, marital status, income, education, and employment. The results of the study showed that different levels of attainment within each of the social demographics influenced the degree to which survival time can be experienced. It was not surprising that the results for the variable, age, showed an inverse relationship between aging and the chance of reaching the 5-year survival time. Studies have shown that the chance of surviving major morbidities tend to decline with the increasing age of the patient (Luo et al., 2014). The results of my study further showed that there was no association between Marital Status and PaCa survival rate.

There is no one single type of PaCa. This fact is responsible for the difficulty, and at the same time the urgency in exploring other factors that provide the possibility of establishing a relationship with the survival rate of PaCa. In their study, *Oxidative Stress: A new Target for PaCa Prognosis and Treatment,* Martinez-Useros, LI, Cabeza-Morales, Garcia-Foncillas (2017) noted that Pancreatic ductal adenocarcinoma (PDAC) is one of the most lethal forms of PaCa whose incidence is rising globally. The authors have confirmed in their study that the already documented risk factors continue to be chronic pancreatitis, diabetes, and some forms of infectious diseases. This study hypothesized that a possible answer to this dilemma would be to entertain the studying of other types of risk habits. This is why this study, which addressed sociodemographic factors other than medical ones, as having an association with the survival rate of PaCa, seems to offer the brightest prospect for new ways of preventing this dreaded form of cancer in the future.

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Appendix A: Seer Data Use Agreement

Last Name: Lewis
SEER ID: 10403-Nov2016
Request Type: Internet Access

SURVEILLANCE, EPIDEMIOLOGY, AND END RESULTS PROGRAM
Data-Use Agreement for the SEER 1973-2014 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 individual level 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.

Signature

4/17/17
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: Lewis | SEER ID: 10403-Nov2016 | Request Type: Internet Access