2008-01-01

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by

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THESIS

Presented to the Faculty of the Graduate School of

The University of Texas at El Paso

in Partial Fulfillment

of the Requirements

for the Degree of

MASTER OF ARTS

Department of Sociology and Anthropology

THE UNIVERSITY OF TEXAS AT EL PASO

December 2008

Acknowledgements

The Minority Health International Research Training (MHIRT) program gave me the opportunity to learn how research was conducted in an international research setting. I thank the supportive MHIRT staff for their assistance, in particular, Dr. Robert Anders, Leticia Paez, and Rosie Saucedo for all their help. Also, big thanks to Dr. Irene Leal, the Facultad de Medicina staff at the Universidad Autónoma de Chihuahua, and the gynecologists at the general hospital Dr. Salvador Zuribran for their availability of resources and readiness to share them. Further thanks should also go to my foster family who guided and fed me during my three month stay in Chihuahua City.

I would like to extend my thanks to the professors at the department of Sociology and Anthropology. Their help in broadening my perspective has been invaluable. I have been impressed by their knowledge and willingness to help. I thank most sincerely the following people: Dr. Tim Collins for his help and information provided that allowed me to use the geographical information system (GIS) map in my thesis to illustrate respondent's place of residency by *municipio*, Dr. Cristina Morales for her help with my data analysis, and the Sociology and Anthropology department chair, Dr. Josiah Heyman for his constant supervision during my educational years in the department and the support during my time in the MHIRT program. I also wish to acknowledge the advice and suggestions of Dr. Michele Shedlin who emphasized that a critical analysis of the data is a contribution to the literature.

I would like to thank my committee members who were always available to help me and guide me in my thesis research. To Dr. Cheryl Howard, I greatly appreciate your patience and numerous hours of guidance in every aspect of my research. My special thanks to Dr. Sara Grineski for guiding me through the statistical analysis. I greatly appreciate your life saving organizational skills. I am grateful to Dr. Charon Pierson for the encouragement to apply to the MHIRT program and help in understanding all the clinical terminology. Finally, I would like to thank Dr. Guillermina Gina Núñez-Mchiri for reminding me that culture is important to view

through the lens of a sociologist. In recognition of all your help and support I would like to mention the graduate students and friends that I met along this journey who supported me. I would also like to thank my family for their support, understanding, and patience during the time of my thesis work.

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Chapter 1: Introduction

Cervical cancer is a disease in which cells on the cervix grow out of control (CDC, 2008). The cervix is located at the end of the womb or uterus and it connects the uterus and the vagina, or birth canal. Cervical cancer affects women globally. In reproductive-aged women, it is a leading killer with about 231,000 deaths annually worldwide and 80% occurring in developing countries (Garcia et al., 2007). Mexico has a mortality rate of 18.1 per 100,000 women 25 years and older (Secretaría de Salud, 2004). The state of Chihuahua has a slightly lower mortality rate of 14.9 per 100,000 women 25 years and older (Secretaría de Salud, 2004). In contrast, the United States has a mortality rate of 3.1 per 100,000 women (National Program of Cancer Registries, 2008) with invasive cervical cancer and Texas is higher with 4.2 per 100,000 women 15 years and older (Texas Cancer Registry, 2004). The mortality rate in Mexico is almost six times higher than the U.S. mortality rate for cervical cancer and the state of Chihuahua is 3.5 times higher than the state of Texas. Incidence rates are new cases of cervical cancer per 100,000 women of reproductive age. The United States has an incidence rate of 8.5 per 100,000 women (National Program of Cancer Registries, 2008) compared to Mexico's incident rate of 29.5 per 100,000 (Secretaría de Salud, 2004). In Texas the incidence rate is 13.9 (Texas Cancer Registry, 2004) as opposed to the state of Chihuahua's incidence rate of 22 per 100,000 (Secretaría de Salud, 2004). The incidence rate for Mexico is almost 3.5 times higher than in the United States and Chihuahua State is 1.5 times higher compared to Texas. Incidence and mortality rates for Chihuahua City are not available.

Survival rates worldwide differ among countries. According to the Center for Disease Control, the Global Cancer Atlas (2007) outlines five year cancer survivorship worldwide per 1,000 people for all cancer survivors within five years. Mexico has a five year survival rate of 2

to 3.9 per 1,000 people compared to the United States survival rate that is almost ten times higher with a 12 to 16.9 rate for 2002. Furthermore, the United States, Canada, Australia and West Europe have the highest survival rates. The survival rates provide a glimpse about how well cancer programs, government policies and other structural factors such as health care access, and cancer screening programs may be influencing survival outcomes.

Cervical cancer is a disease that is treatable if caught early. In Mexico, 16 women die daily because of cervical cancer and the lack of early screening (Zavaleta, 2003). Personally, I have an interest in this topic because of my family medical history. My maternal grandmother died of cervical cancer in 2004 in Ciudad Juárez, Mexico due to lack of early detection. About 90% of cases are recognizable and treatable in the early stages using outpatient procedures (Walsh, 2006).

One important risk factor associated with cervical cancer that has been established in the literature is the human papillomavirus infection (HPV). In 1974, HPV was first hypothesized as a risk factor for cervical cancer. In 1968, the term cervical intraepithelial neoplasia (CIN) was coined to refer to the range of cells confined to the epithelium, or the thin protective layer of tissue located in the cervix. This CIN were divided into grades 1, 2 and 3. "CIN 1 corresponded to mild dysplasia, CIN 2 to modern dysplasia, and CIN 3 corresponded to both severe dysplasia and carcinoma in situ" (Sellor & Sankaranarayanan, 2003). Dysplasia means abnormal cells found in the cervix tissue. These three groups were classified as such depending on the depth of the lesions on the protective layer of tissue on the cervix, or epithelial tissue. After the three grades of CIN, invasive cervical cancer was present.

According to Sellors and Sankaranarayanan (2003), the U.S. National Cancer Institute "convened a workshop to propose a new scheme for reporting cervical cytology results…held in 1991 became known as the Bethesda system (TBS)." The main feature of TBS was the creation

of the term squamous intraepithelial lesion (SIL), and a two-grade scheme consisting of low-grade (LSIL) and high-grade (HSIL) lesions. The squamous intraepithelial lesions (SIL) are the current classifications for cervical lesions. In the Bethesda system, the low-grade squamous intraepithelial lesion was CIN 1; the high-grade SIL was CIN 2 and 3. A diagnosis that has reached beyond the level of depth for CIN 3 is either carcinoma in situ or invasive cervical cancer. Carcinoma in situ is a cluster of malignant cells that has not spread deeper into the epithelial tissue or to other parts of the body but have stayed in the same place on the cervix. Invasive cervical cancer is the invasion of malignant cells deep into the epithelial tissue where a tumor is present (Shepard et al. 2000). Women with invasive cervical cancer have physical symptoms such as vaginal bleeding or vaginal discharge; however, "early on, cervical cancer usually does not cause signs and symptoms" (CDC, 2008).

The human papillomavirus infection (HPV) is an established risk factor in the literature (Aldrich et al. 2006, Bernal et al. 2003, Lazcano-Ponce et al. 2001, Gerberding 2004, Piña-Sanchez et al. 2006, Shields et al. 2004 & Castañeda-Iñiguez et al. 1998). Certain strains of the virus are currently found in 99.7% of all cervical cancer cases (Piña-Sanchez et al., 2006). When a woman is infected with the human papillomavirus, it will take three to five years for the HPV infection to transform into squamous intraepithelial lesions (SIL) that may progress into invasive cervical cancer. The latency period between HPV infection and cervical cancer is between five to ten years (Quijada, 2006). "The peak prevalence of HPVs infecting the cervix occurs among young women initiating sexual intercourse…in their teens and twenties, whereas the median age of cervical cancer diagnosis is two decades later" (Shields et al., 2004). In addition to HPV, certain behaviors increase women's risk for cervical cancer. Behavioral risk factors play a role in cervical cancer mortality and incidence as well as access to diagnostic exams, treatment and

follow-up care. These risk factors combined result in the increased probability of cervical cancer identified through methods of diagnosis such as a Pap smear exam and a Colposcopy exam.

Risk behaviors that are associated with cervical cancer include smoking, number of live births, number of sexual partners, age at first sexual intercourse, use of oral contraceptives (OC), and a woman's history of sexual transmitted diseases (STD) other than HPV infection. A woman with a high risk HPV strain (16, 18, 31, 33, 35, 39, 45, 51, 52, 54, 56, 58, 59, 66, 68, and 69) (Quijada, 2006) in conjunction with one or all risk behaviors (smoking, use of oral contraceptives, age at first sexual intercourse, sexually transmitted disease, number of live births and number of sexual partners) is more likely to be diagnosed with cervical cancer because each action is linked to the transformation of cells on the cervix, and HPV infection within a length of time to exposure. For instance, women are at a higher risk for cervical cancer if they began to have sexual intercourse at a young age and have numerous sexual partners. These actions increase the risk for HPV infection and other sexually transmitted diseases. The absence of oral contraceptives, assuming that no barriers are used such as condoms use, increases a women's risk for HPV infection. Smoking and the number of live births are associated with cell transformation. According to the Harvard Cancer Prevention Center, "cigarette smoke contains chemicals that can damage the genetic structure of the body's cells and cause them to become cancerous [as a result], women who smoke cigarettes have a higher risk of cervical cancer" (2004). Also, "women who give birth to 2 or more children have a higher risk for cervical cancer; this may be related to injury that occurs to the cervix when the baby leaves the uterus (womb) through the cervix" (Harvard Cancer Prevention Center, 2004).

These risk behaviors are not the only factors that affect cervical cancer diagnosis. Health care access, gender inequalities, and health literacy are social and cultural concepts that may influence cervical cancer mortality and incidence rates. Other factors such as living in

urban and rural areas, socioeconomic status, cultural and religious beliefs contribute to an understanding of cervical cancer and HPV infection.

My study will focus on six risk behaviors, place of residency, and two methods of cervical cancer diagnosis in my sample of women attending a dysplasia clinic in Chihuahua City, Mexico. Identifying risk factors and cervical cancer in women living in the state of Chihuahua will provide valuable information for cervical cancer research in order to establish cultural relevant prevention programs that target specific behaviors influencing a woman's risk of HPV infection. In addition, understanding cervical cancer risk behaviors through a medical sociological theory such as the health lifestyle theory allows for a macro-perspective of how women are influenced by external forces such as access to care, gender inequalities and health literacy that explains individual level risk behaviors. Understanding risk behaviors through the health lifestyle theory is useful in analyzing issues that create barriers in reducing incidence, mortality and increasing survival rates of cervical cancer.

1.1 Problem

Cervical cancer mortality rates are almost six times higher in Mexico than the United States as are mortality rates in Chihuahua State compared to Texas. In spite of these high mortality rates, a national cervical cancer detection program was implemented in Mexico "more than 20 years [ago], [but] less than 13 percent of the potentially preventable cases have been averted (Lewis, 2004). Identifying risk behaviors in women living in the state of Chihuahua is important in understanding what behaviors might need to be addressed in cervical cancer screening programs for better cervical cancer survival outcomes. Although my study is not population-based, it is important because it was conducted to identify risk behaviors of women living in the state of Chihuahua in relation to cervical cancer diagnosis and place of residency. The women attending the Dysplasia clinic in Chihuahua City were all diagnosed with an

abnormal Pap smear. The Pap smear was conducted at their local health clinics near their places of residency. The results of this exam were then given to gynecologists at the Dysplasia clinic for a diagnostic reading to the patient. The majority of women in my sample (77.6%) were given the Colposcopy exam in addition to the Pap smear. All of the women in the sample were at a higher risk for cervical cancer compared to the general population of women in Chihuahua State. Within this high risk sample of women, I compare risk behaviors with cervical cancer results and place of residency of women attending the Dysplasia Clinic in Chihuahua City. Also, the Pap smear and Colposcopy methods of diagnosis and women living in urban and rural areas will be compared along the following risk factors: ever smoked, oral contraceptive use, sexually transmitted diseases other than HPV, the number of sexual partners and live births, and age at first sexual intercourse. The results will provide useful information in risk behaviors within this sample to identify the strongest behavior associated with cervical cancer. The results will also examine the connection between women living in urban and rural areas and their risk behaviors.

One problem with the cervical cancer statistics for Mexico and the state of Chihuahua is the natural history of the cervical lesions. The methods of diagnosis are the Pap smear exam and the Colposcopy exam. These exam results classify lesions into low squamous intraepithelial lesions (LSIL) and high squamous intraepithelial lesions (HSIL). Detailed descriptions of these lesions are discussed in section 1.4; however, these lesions are able to regress to normal after 24 months. For example, low squamous intraepithelial lesions have 47.4% chance to return to normal, and a 20.8% chance of transforming into a high squamous intraepithelial cells and even a smaller percentage (0.2%) to become invasive cervical cancer after 2 years. Women diagnosed with a high squamous intraepithelial lesion has a 35% chance of the mutant cells on the cervix to become normal, a 23.4% of persistent HSIL and a 1.4% of these lesions to progress into invasive cancer. According to Sellors and Sankaranarayanan (2003), “a meta analysis of 27,000 women

gave the weighted average rates…at 24 months based baseline cytological abnormality" to determine percent of regression to normal and progression to HSIL. These percentages give hope to women with cancerous lesions; however, high mortality rates persist in Mexico and Chihuahua State.

1.2 Research Questions

The following questions will be explored, but not statistically tested in this study. What social and cultural aspects of society influence risk behaviors associated with cervical cancer? What other risk factors might influence a women's probability for cervical cancer? Why are certain risk factors stronger in determining the probability of cervical cancer than others? Why is cervical cancer a leading cause of death for women in developing countries such as Mexico, even though it is a treatable, if not a preventable, disease?

In this study, the following research questions will be addressed with statistical measures.

1) Which risk behaviors are statistically associated with the Pap smear method of diagnosis for cervical cancer? Which are the most important factors in the strength of association for the Pap smear method of diagnosis?

2) Which risk behaviors are statistically associated with the Colposcopy method of diagnosis for cervical cancer? Which risk factors are the most statistically significant for the Colposcopy method of diagnosis?

3) Which risk behaviors significantly predict the most important risk behavior identified in the Pap smear and Colposcopy method of diagnosis for cervical cancer?

4) How do risk factors and cervical cancer diagnosis vary between the urban and rural areas?

1.3 Significance of Study

My study uses a dataset collected in the summer of 2007 in a Dysplasia clinic located in Chihuahua City for the purpose of identifying risk behaviors that contribute to cervical cancer. This dataset was collected by Dr. Leal, a professor at the University of Chihuahua, Carlos Dominguez, a medical student and me, an international graduate research assistant. The survey data was given to me by Dr. Leal for the purpose of my thesis and does not have any identifying information. Not much is known about the women of Chihuahua and their habits related to cervical cancer risk and this dataset is unique in that it is relatively complete and collects information on many variables of interest; therefore it has the potential to uncover a great deal of useful information about cervical cancer thus adding to the body of knowledge about cervical cancer in this area of Mexico.

My study provides the following contributions to the knowledge of cervical cancer literature. First, my contribution to the literature is the location of the sample under study. Studies have not been conducted with women attending a dysplasia clinic in Chihuahua City, Mexico. The risk behaviors in my study have been used before; however, not one study has been conducted in a clinical setting in Chihuahua City. Second, the comparison of women living in rural and urban areas based on risk behaviors in a clinical setting located in Chihuahua City will add to the knowledge of cervical cancer because other studies in the literature use meta-analysis or case-control design. Third, my contribution to the literature is a critical sociological perspective to the medical dataset in order to understand the problem of high rates of cervical cancer in Mexico and Chihuahua State. The fourth contribution to the literature is suggesting cultural relevant solutions to decrease the high rates of cervical cancer in Mexico. Finally, my last contribution to the literature is the application of a recent theoretical framework published by William Cockerham in 1997 that has not been used before in cervical cancer studies. William

Cockerham's health lifestyle theory explains how external factors (socialization and experiences) and internal factors such as life choices (decisions individuals make according to their experiences) and life chances (decisions made based on structures the individual cannot control) will affect an individuals' thought processes that guide their actions (choosing the number of sexual partners) and evaluate those actions to either change or repeat it (Cockerham 2000, Cockerham 2005 and Cockerham, Rütten, & Abel 1997). In order to understand why women practice risk behaviors, it is imperative to understand individual choices and in what context an individual makes such choices repeatedly.

1.4 Definitions and Operational Terms

In this study, both dependent and independent variables are dichotomized for the analysis and in order to calculate the relative risk of cervical cancer as an odds ratio with respect to the dependent variables. The number of live births was dichotomized in this analysis; however, this variable was also included as continuous. Five of the six risk behavior independent variables are separated into two options. First, the age at first sexual intercourse is 16 years or younger and 17 and older. The wording in Dr. Leal's survey is confusing because it does not outline this separation because the options are before 16 years and after 16 years. However, at the beginning of the data collection a consensus decision resulted in changing this variable to 16 and younger and 17 and older even though the wording was not changed. Second, the number of sexual partners was divided into women having six or fewer partners and more than seven partners. This variable was also addressed early on and was verbally changed. The number of live births was collected as a continuous variable and used as such for the purpose of the analysis. In addition, the number of live births was classified into two variables. For example, women with 0-2 live births and women having 3 or more live births were analyzed. Second, women with 1-2 live births, 3-5 live births and 6 or more live births were compared to women with no live births

in the analysis. The use of oral contraceptives in Dr. Leal's survey consisted of three options: no, yes with less than 5 years of use and yes with more than 5 years of use. In this study, all the yes responses were placed in a category and the no responses were placed in another. Sexually transmitted disease (other than the human papillomavirus) had two responses yes and no. Smoking had no, yes, and the number of years last smoked. In this study, smoking is divided into yes and no.

The dependent variables were place of residency by *municipio,* cervical cancer diagnosis by Pap smear and Colposcopy diagnostic exams and the number of live births. Place of residency is where the respondent lives at the time of the survey. This variable is divided into urban and rural areas. The urban area is defined as respondent's living in Chihuahua City because the city is the second largest urban area in the state with a total population of 758,791 (INEGI, 2005). The rural area is defined as the 26 rural (semi-urban and rural) towns. This dissection was made because half of the respondents lived in Chihuahua City (50%) and the other half of respondents lived in the 26 rural areas in the state of Chihuahua. Cervical cancer diagnosis is provided through two methods of detection: the Pap smear and Colposcopy exams. My study will be using the 1991 version of the Bethesda system (TBS) of squamous intraepithelial lesions that are classified into two grades based on the Pap smear and Colposcopy diagnostic exams. The low squamous intraepithelial lesions (LSIL) are CIN 1; also known as pre-cancerous. The high grade squamous intraepithelial lesions (HSIL) are CIN 2 and 3; also known as invasive cervical cancer. The number of live births as a continuous variable was used as a dependent variable in comparison to the five risk behaviors (smoking, oral contraceptive use, age at first sexual intercourse, number of sexual partners, and sexually transmitted disease) and place of residency by *municipio* were included as independent variables. Further explanation of these variables is discussed under the Variable List in the Methodology chapter.

Chapter 2: Literature Review

Epidemiologists and social scientists from different countries have published valuable information on cervical cancer mortality, incidence and the risk behaviors that affect a particular population through a variety of methodological approaches. Journal articles published within the last 12 years provide a connection between risk behaviors that increase the probability of cervical cancer and the link between cervical cancer and the human papillomavirus as an important determinant for this specific cancer. The literature is almost exclusively quantitative except for a few qualitative studies. For example, Garcia et al. (2007) presents perceptions of cervical cancer and the human papillomavirus through the eyes of reproductive age women living in Mexico City. Another study explores men's perception about HPV and cervical cancer at the university level (McPartland et al., 2005), and yet another identifies barriers and perceptions about the Pap smear exam in Ireland (Walsh, 2006). The majority of the quantitative studies are population based (Lewis 2004 & Palacio-Mejia et al. 2003), case-controlled (Moreno et al. 2002 & Shields et al. 2004), reviews (Shepherd et al. 2000, Castellsagué et al. 2002, Smith et al. 2003 & Merrill et al. 2005) or meta-analysis (Santos-Silva & and Danaei et al. 2005).

Only a few studies were conducted in Mexico. Bernal et al. (2003) conducted a population-based study in Morelos, Mexico identifying women with HPV infection and pre-cancerous lesions or cervical intraepithelial neoplasia grades 1, 2 and 3. Lazcano-Ponce et al. (2001) also did a population study using the Morelos State Household Sampling Frame to identify women with HPV infection with normal Pap smears. Castañeda-Iñiguez et al. (1998) conducted a survey to identify risk factors for women with cervical intraepithelial neoplasm (CIN) 3, carcinoma in situ and cervical cancer in the state of Zacatecas, Mexico. The Garcia et al. (2007) study was conducted in Mexico City, Mexico as described above.

2.1 Risk Behaviors

Not all risk factors are equal in estimating the probability of cervical cancer. Risk factors vary by strength of association. The strength of association is the reasonable confidence of connecting an exposure (e.g. multiple sex partners) to an outcome (e.g. probability of cervical cancer). There are weak and strong associations between exposure and outcomes. Some risk factors are stronger than others. For example, according to the literature, age at first sexual intercourse, the number of sexual partners and the number of live births are strongly associated with the probability of cervical cancer. On the other hand, weak associations to cervical cancer are smoking, sexually transmitted diseases (other than HPV infection), and the use of oral contraceptives. Risk behaviors will be separated into weak and strong associations to cervical cancer, according to the literature.

The strength of association concept was coined by Colditz et al. (2000) at the Harvard Center for Cancer Prevention. These authors created a cancer risk index that analyzes risk variables to determine the strength of the association to cervical cancer. Variables were categorized into definite, probable and possible strength of associations to cervical cancer. This index projects younger aged-women at first sexual intercourse, number of live births, multiple sex partners, no use of barrier methods (condom or diaphragm use), no Pap smear exam in the last 3 years, and low socioeconomic status as having a definite association with cervical cancer. A definite strength of association is "a [connection]…established between the exposure and outcome, in which chance and [biases] can be ruled out with reasonable confidence." Smoking and a history of a sexually transmitted disease (other than HPV) is classified as a possible strength of association because it "has been observed between the exposure and the outcome but chance or [biases] cannot be ruled out with reasonable confidence." Likewise, possible associations include vegetable and fruit intake, partner circumcision, oral contraceptive use and

maternal prenatal exposure, according to Colditz et al. (2000). These possible strengths of association are derived from studies that are of insufficient quality, consistency or statistical power to be conclusive. The information provided by Colditz et al. (2000) is taken from the International Agency for Research on Cancer (IARC) dataset and were classified as such based on the Surveillance Epidemiological and End Results (SEER) published rates; resulting in 13 cancers for women and 10 cancers for men that make up 80% of cancer incidence in the U.S. As a result, cervical cancer was included in this analysis to estimate risk for this specific cancer.

In addition, risk behaviors are also categorized as having a direct and indirect link to HPV infection and ultimately cervical cancer. For example, Castellsagué et al. (2002) identifies risk behavioral factors that estimate the risk of HPV infection. They separate risk behavior into those that have a direct link to cervical cancer results, and co-factors as variables that are indirectly associated with cervical cancer. This is similar to the HPV literature projecting certain risk behaviors to cause cell transformation in the cervix or HPV infection that is a direct link to the probability of cervical cancer (Zavaleta 2003, Piña-Sánchez et al., 2006, McPartland et al., 2005, Lewis 2004, Garcia et al., 2004 & Bernal et al., 2003). In contrast, an indirect factor does not influence a cervical cancer diagnosis; however, these variables impact the direct variables that are linked to cervical cancer. To illustrate, oral contraceptive use is an indirect behavior because it may assume that women using them are having sex and as a result may be at a higher risk for HPV infection. Authors in the literature have different labels for understanding behaviors and the links to cervical cancer but in this review of the literature the six risk behaviors will be categorized as having a weak or strong association to cervical cancer. The dependent variables, residency and cervical cancer diagnosis will be discussed including the link between HPV and cervical cancer. The last section will include variables that were absent in Dr. Leal's

survey but present in the Harvard online survey and additional variables that that should be considered in future research that were not present in either survey.

2.1.1 Strong Association Risk Factors

Age is a key factor in cervical cancer. The latency period for both HPV infection and cervical cancer depends on the age at which the risk behaviors begin. As a woman grows older, the risk for cervical cancer increases only if risk behaviors are practiced. The risk behaviors that have a strong association to HPV infection and cervical cancer are directly related to sexual behavior and the length of exposure to unprotected sex, for example, age at first sexual intercourse, the number of live births and the number of sexual partners.

Age at first sexual intercourse is strongly association with cervical cancer because the younger a woman experiences sexual relations the higher her risk for high risk HPV strains that may transform into cervical cancer. In the Dr. Leal's survey age at first sexual intercourse is separated into women 16 years and younger and 17 years and older. Castañeda-Iñiguez et al. (1998) found that in the state of Zacatecas "women [had] the highest risk for cervical cancer when age at first sexual intercourse is 16 years or younger." Participants filled out questionnaires through the Cervical Cancer Prevention and Control Program and these women all were diagnosed with invasive cervical cancer during 1993-1995 in this retrospective study. Also, Lazcano-Ponce and colleagues (2001) recruited women with normal pap smears in the state of Morelos, Mexico and reported the reverse. Women 17 years and older were almost twice as likely to have a cancer associated HPV infection compared to women younger than 16 years. Another study found that women beginning their sexual experiences at around age 15 were twice as likely to get HPV compared to women who did so after the age of 20 (Shephard et al. 2000). The age at first sexual intercourse is an important risk behavior that determines the probability of

cervical cancer. The risk increases if the number of sexual partners is taken into consideration when determining cervical cancer diagnosis.

The number of partners a woman has sexual relations with throughout her life increases the level of risk for both HPV infection and cervical cancer because women are more likely to become infected with HPV. A systematic review by Shephard et al. (2000) presents sexual lifestyles as important determinants for cervical cancer. "The greater number of sexual partners a woman has without the use of condoms, the greater the risk of coming into contact with HPV and of later developing cervical cancer" (Shephard et al. 2000). HPV has a latency time of 5-10 years after infection. HPV infection has a strong link to the number of sexual partners; however, barriers such as condoms or diaphragms must be taken into account because these barrier methods help prevent the sexual transmission of HPV. The number of sex partners correlates with the age at first sex when projecting a risk estimate for HPV infection and cervical cancer.

Age at first sexual intercourse and the number of sexual partners relate to the number of live births, a strong indicator of association to cervical cancer. The first two variables relate to the vulnerability of HPV infection as does the number of live births. For example, every time a woman has a child, the cells in the cervix can transform into cancerous cells as discussed by Castallsagué et al. (2002). These authors explain that "high parity, [or pregnancy] may also increase the risk for [cervical cancer] because it maintains the transformation zone on the [cervix] for many years [and] hormonal changes induced by pregnancy may also modulate the immune response to HPV and influence risk of persistence or progression." The authors define parity as the number of full term pregnancies or live births. Castallsagué and colleagues (2000) used the International Agency for Research on Cancer (IARC) case-control studies conducted in Spain, Colombia, Thailand, Morocco, Brazil, the Philippines, Peru, and Paraguay to identify "environmental co-factors in HPV [infection] as assessed from selected studies that report

associations within a well-defined HPV-positive group." Furthermore, Piña-Sánchez et al. (2006) "found that women with more than five pregnancies had a 14-fold increase in risk compared to women with two pregnancies or [no pregnancies]." This study was conducted in Mexico City to evaluate the prevalence of HPV types and its association to cervical intraepithelial neoplasm in Mexican women from two different hospitals. The authors suggest that pregnancy is an important factor because their results show that women with low squamous intraepithelial lesions (LSIL) who have had five or more pregnancies were twice at risk for cervical cancer than women with 0 to 2 pregnancies. The number of live births, age at first sexual intercourse and the number of sexual partners are strong predictors for HPV infection and cervical cancer diagnosis. These predictors all point to exposure over time to unprotected sex.

2.1.2 Weak Association Risk Factors

Oral contraceptives are generally, but not always, used to prevent an unwanted pregnancy. Oral contraceptives are not preventive measures for the human papillomavirus but indicate sexual activity. According to Colditz et al. (2000) oral contraceptives use is weak in association to cervical cancer because it decreases the risk of live births but does not protect against sexually transmitted diseases such as HPV. Some studies have found that the duration of oral contraceptive use is important. For example, Moreno et al. (2002) used analytical results from different investigations done in Thailand, the Philippines, Morocco, Brazil, Peru, Paraguay, Colombia, and Spain provided by the International Agency for Research on Cancer (IARC). The incidence of cervical cancer for each country were similar in that overall "women starting oral contraceptives before [the] age [of] 20 were almost three times more likely to develop cervical cancer…risk [and] was more likely to be determined by duration of oral contraceptive use than by age at first use" (Moreno et al., 2002). The studies indicate that a woman taking oral contraceptives during the past five years had a higher risk of developing cervical cancer and it

increased further for women who were diagnosed with the human papillomavirus. The studies do not distinguish between the different types of contraceptives; nonetheless, it is a risk factor for cervical cancer. Smith et al. (2003) found similar results in a systematic review of epidemiological studies from Medline between 1966 and 2002 showing that risk increased as duration of oral contraceptive use increased. Women not using oral contraceptives for the prevention of pregnancies may not be using condoms to protect against pregnancies and sexually transmitted diseases. To illustrate, Bernal et al. (2003) conducted a population study in Morelos, Mexico and found that 83% of women with precancerous lesions (LSIL and HSIL) and HPV do not use oral contraceptives and 85% of women did not use a condom as a means of birth control." These are important factors that contribute to the increased risk for cervical cancer. Possible explanations might include cultural and religious beliefs in this population of women and lack of access to protective measures such as condoms. These additional variables will be discussed later in the chapter.

Sexually transmitted diseases (STD) such as gonorrhea or the human immunodeficiency virus (HIV) likely increase a woman's risk for cervical cancer. Research has found no strong evidence to conclusively suggest that an STD other than the human papillomavirus is linked to cervical cancer; however, an STD (HIV or gonorrhea) with HPV infection may cause cancer cell growth. To illustrate, Castellsagué et al. (2002) found that among women with HPV, genital herpes was higher in women with invasive (44.4%) and carcinoma in situ (43.8%) than with the control group (25.6%). According to the authors, women who were HIV positive had an increased risk of cervical intraepithelial neoplasm (CIN) compared to women with a negative HIV test; however, when a woman has HIV and HPV the risk for cervical cancer is twice as likely, compared to a woman who have either HIV or HPV. Also, Colditz et al. (2000) creators of the Harvard Cancer Risk Index suggest that women with a history of an STD have a much

higher risk for cervical cancer. The association between other sexually transmitted diseases and cervical cancer is weak and more research must be done to understand this connection.

Smoking is another weak risk behavior that is associated with cervical cancer. In a worldwide analysis of mortality from site-specific cancers, Danaei et al. (2005) identifies smoking as a link to cervical cancer mortality. The study evaluates the Comparative Risk Assessment Project to do a systematic review and meta-analysis to estimate worldwide and regional mortality from specific cancers. The authors project estimates of cervical cancer worldwide, in low and middle income countries and high-income countries. According to the authors in all three categories of countries, smoking has a higher risk impact in high income countries than in low and middle income countries. Even more so, according to Castellsagué and colleagues (2002), "smoking has been related to [cervical cancer] since the late 1970s, based upon the correlations between [cervical cancer] incidence and the incidence of other tobacco related cancers" as investigated by Winkelstein in a 1977 study. The length of time smoking versus past and current smokers varies the risk. Current smokers had an elevated risk for cervical cancer and the trend increased as the years of smoking and number of cigarettes increased in U.S. women exposed to HPV (Shields et al., 2004). The duration of smoking and whether women have ever smoked are important risk behaviors to consider despite the weak link to cervical cancer.

2.2 *Municipios*, Cervical Cancer and HPV

In order to understand cervical cancer incidence and mortality, women's place of residency should be taken into account. The present study contributes risk behavior information in a Chihuahua City clinical setting compared to rural and urban areas. There are differences between women living in urban and rural areas. Palacio-Mejia et al. (2003) in a population-based study compares rural and urban areas for the 32 states in Mexico for the purpose of

understanding poverty and its effect on cancer between urban and rural areas. The data was collected from national databases to calculate cervical cancer mortality. The authors argue that the "place of residence is a social variable, and a higher cervical cancer mortality risk in relation to residency reflects, to a great extent, health inequalities. For example, there are huge differences between urban and rural areas in terms of coverage of cervical cancer early detection programs and limited access to health services. This is evident in the results of the study where the state of Chihuahua is projected to have more deaths in rural areas as opposed to urban areas (Palacio-Mejia et al., 2003). The authors divide the states into *municipios* with less than 15, 000 inhabitants and *municipios* that have 15,000 inhabitants or more. The authors further conclude that in Mexico, "cervical cancer mortality risk is three times higher in rural areas, as compared to urban zones" (Palacio-Mejia et al., 2003). However, in my study this dissection was not used. Instead, in my study, Chihuahua City is the urban area and the other 26 *municipios* are considered rural areas. There are, unfortunately, some urban places in the rural areas. Location can be a barrier for access to care, that in turn, influences the ability to attend screening programs for cervical cancer.

The Pap smear is a screening exam that detects abnormal cells by scraping cells from the cervix with a brush and placing them on a slide for laboratory analysis. The Colposcopy is a test that uses a microscope to magnify the cervix and determines if any cell changes have occurred. The Colposcopy is a complementary exam that is often done after an abnormal Pap smear (Quijada, 2006). These two exams are diagnostic methods for cervical cancer. These exams result in a diagnosis of either pre-cancerous lesion or invasive cervical cancer. In Ireland, Jan C. Walsh (2006) published an article identifying women's perceptions of a Pap smear and barriers of attending this cervical screening exam. The author identifies the knowledge about the exam, past experiences, perceived barriers and risks of receiving a Pap smear. Women were randomly

selected from the Irish Cervical Screening Program register in the Mid-Western Health Board Area in Ireland. Almost three fourths (70%) of the 1,114 women responded that doctors were their primary source of information about cervical cancer screening. The newspaper came in second with about 20%, and information provided by a friend was received by about one fourth (16%) of the respondents on cervical cancer screening. Women's experiences of a pap smear were not very pleasant. "Over 26% of women stated that the way in which a smear test was performed caused them some distress…and most women experienced some degree of discomfort (69%) or unpleasantness (67%). However, 71% of women described the experience 'very' or 'extremely' reassuring." Furthermore, the authors compared women who attended a Pap smear screening and women who had never attended. "Non-attenders were more likely to perceive having a cervical smear test as being more time consuming, causing greater distress and [reported] being more afraid of the test than attenders." These results provide information about perceived barriers that must be addressed in future research because these same barriers probably exist in the Mexican population. Additionally, Palacio-Mejia et al. (2003) study "showed that 40% of women at risk in the rural area had not had even one Papanicolaou test, while over 75% of women living in Mexico City had received one or more Pap tests." Understanding these perceptions will give screening program researchers information to combat the myths and misconceptions of a Pap smear exam. The diagnostic exams are an issue in Mexico because screening programs may not be cultural relevant. This problem may be resolved with public programs accessible to the public in rural areas that understand cultural barriers that influence a women's decision or ability to have a Pap smear.

In the mid 1970s, the HPV link to cervical cancer was published and established in the literature as a risk factor for cervical cancer. There are more than 100 different types of HPV infection that are categorized into high and low risk for cervical cancer (Zavaleta, 2003 &

Quijada, 2006). It is a fact, though, that not all strains of HPV will mutate into cancerous cells. In the literature, studies dealing with HPV infection compare HPV infection and no HPV and some studies include HPV types to investigate the most prevalent strains in a population. To illustrate, Bernal et al. (2003) investigated the relationship between HPV infection and the three degrees of cervical intraepithelial neoplasm (CIN) and found that half (54.13%) of women with CIN were HPV positive; and 13.9% were HPV negative. This study was conducted in Morelos, Mexico between 1996 and 1999. Women in this sample were diagnosed for the first time with a cervical intraepithelial neoplasia grade (1, 2 or 3) and selected from three public clinics and four private hospitals. Lazcano-Ponce et al. (2001) conducted a study in Morelos, Mexico using the Morelos State Household Sampling frame of 33 municipalities. Eligible women included in the sample had to have a history of sexual activity and reside in Morelos state for at least 1 year. According to the authors, "the estimated overall prevalence of HPV in this population…was 14.5%. In addition, this study analyzed specific types of HPV viruses. [There were] 24 different HPV types detected in the overall sample. However, high risk HPV types 16, 53, 31, and 18 were the most common detected alone or in combination" in this sample of women living in Morelos State. HPV specific types have been studied in correlation with cervical intraepithelial neoplasm grades. For example, Piña-Sanchez et al. (2006) also wanted to evaluate the prevalence of HPV strains according to the different stages of CINs in two different hospitals located in Mexico City. About half of the women diagnosed with low squamous intraepithelial lesions (LSIL) also known as CIN 1 were diagnosed with high-risk HPV strains. HPV type 16 was the most common type for all of the women in the sample. The second most common type was HPV 58. The link between HPV and cervical cancer is established in the literature.

2.3 Additional Variables to Consider

Additional variables should be considered when understanding cervical cancer risk behaviors and HPV infections. For example, variables not included in Dr. Leal's survey but provided in the Harvard online survey. For example, questions about previous diagnosis of cancer apart from skin cancer and the primary source of birth control (condoms or diaphragms) were excluded from Dr. Leal's survey; instead the use of oral contraceptives as a method was asked.

The following additional factors are important for future research but not discussed in either the Harvard online survey or Dr. Leal's survey. For example, the socioeconomic status of an individual relates to health care access. Identifying women's type of health care and availability of health care services are interesting influential factors that might have an impact on screening for cervical cancer. Furthermore, the location of women's residency in relation to the dysplasia clinic or health center is important because transportation is a barrier for obtaining a Pap smear. Also, health policies set by government officials in Mexico will have a major impact on cervical cancer.

Health literacy is a concept that hasn't had much attention in the literature. Health literacy pertains to the information given by doctors and nurses to patients on cervical cancer, HPV infection and screening exams. Aldrich et al. (2006) study conducted in Mexico City assessed physicians and Obstetrician-Gynecologist (Ob-Gyn) knowledge on cervical cancer and HPV screening. Ob-Gyn physicians are more knowledgeable than general physicians. For example, 83% of Ob-Gyns have read or are informed about cervical cancer compared to 77% of general physicians. This information of cervical cancer include the risk behaviors, time a Pap smear should be conducted, and when. Also, 84% of Ob-Gyns recommend a Pap test after first sexual intercourse regardless of age compared to 79% of general practitioners. Both groups of

physicians know that the principal cause of cervical cancer is the human papillomavirus. General physicians have an overall understanding about cervical cancer such as HPV is the principal cause and knew that after a normal Pap smear every three years a woman should continue testing. On the other hand, Ob-Gyn physicians are more knowledgeable and correct in specific questions about cervical cancer screening and the length of time lesions may become cervical cancer.

Cervical cancer is a woman's health issue. However, human papillomavirus infection is a health issue concerning men and women, despite its link to cervical cancer. Studies linking HPV and cervical cancer have been established in the literature and focus on women; however, men's perception and knowledge about cervical cancer and HPV should be taken into account because men can spread HPV to women as women can give it to men. To illustrate, McPartland et al. (2005) attempts to understand men's perception and knowledge about the human papillomavirus and cervical cancer in men attending a university. Location of the university is not disclosed; however the sample included 166 university male students, primarily Caucasian (80.5%). The men were in their 20s and 89.5% of respondents preferred women as their sexual partners. The average number of lifetime female sexual partners was 5.2; while the average number of female sexual partners in the past year was 2.2. The mean number of female sexual partners in the past four months was 1.3 and 8.5% of respondents have had a sexually transmitted disease in their lifetime.

Lists of true and false questions were asked to assess HPV and cervical cancer knowledge and perceptions. The majority of men (89%) knew that HPV causes cervical cancer, and 79.9% also answered correctly that most people with genital HPV had no visible signs or symptoms. Questions pertaining to the Pap smear diagnosis were not answered correctly by the majority of the respondents. For example, 72.6% answered incorrectly when asked if a woman's pap smear

is normal, she does not have HPV, 68.9% were wrong in answering changes in a Pap smear may indicate that a woman has HPV, and 79.9% responded thought that Pap smears will almost always detect HPV. Furthermore, 73.8% were not aware of a vaccine being developed to prevent HPV infection. The authors state that "our findings are similar to those of earlier studies that found that men do not perceive themselves to be susceptible to HPV" (McPartland et al., 2005). Furthermore, men provide researchers with valuable information about their perception of HPV infection; however, no information is available on men's perception of the HPV vaccine even though a vaccine trial is currently underway for adolescent boys and young men. "Researchers are uncertain about the value of vaccinating boys and young men because less is known about the incidence, duration and host response to HPV infection in men" (Partridge & Koutsky, 2006).

Exploring women's perception about HPV and cervical cancer is a recently emerging issue in the literature. However, further exploration is necessary in certain populations such as women living in Chihuahua City. Garcia et al. (2007) conducted a qualitative study in Mexico City where eight focus groups with middle-aged and young women were formed and respondents were asked questions about their perception of HPV and cervical cancer. The focus groups sessions were broken up into four sections: knowledge and attitudes about cervical cancer, non-HIV sexually transmitted disease including HPV, then respondents compared their answers from the previous sessions and finally a training workshop of fifteen minutes were given to explain the relationship between the human papillomavirus and cervical cancer. Two focus groups were compared, a younger group with a mean age of 22 and an older group with a mean age of 51. Overall, participant's conceptualization of cervical cancer as death was shared by both focus groups despite participant's general knowledge that cervical cancer is preventable when caught at an early stage. A young woman says, "If I were to have cancer, I would tell my

mom because it isn't bad at all and you don't just get if from having sex; there are lots of other causes" (Garcia et al., 2007). Even though women believed cervical cancer was a disease that could be shared with family and friends, a sexually transmitted infection was a private matter as an older woman says "Just imagine! People will criticize you. What would your friends say about you? What would your family say" (Garcia et al., 2007)? Older respondents also said that a sexually transmitted disease would have dire consequences to their marriage and the general response for this group was anger as an older women responds when asked what she would do about an STD, "I'd grab a bat and crack my husband's skull" (Garcia et al., 2007).

A barrier for cervical cancer screening is that young respondents thought it was for older women as a young woman states "What's more, you associate the Pap test with older women, with your mothers. You never think that you have to do it" (Garcia et al., 2007). Moreover, older participants associated a sexually transmitted disease with younger women. Four of the 50 participants were aware that HPV was linked to cervical cancer before any information was given. Misconceptions about both health illnesses were identified and the author suggest peer-led educational presentations to dispel such myths. Exploring cultural barriers about HPV and cervical cancer will provide culturally competent educational programs to explain the link between these two diseases and what can be done to prevent or detect them.

Age at first sexual contact was presented as a strong association to cervical cancer; however, the literature also includes age at first live birth as an important variable. For example, Merrill and colleagues (2005) state that "cervical cancer risk has also been linked to maternal age at first birth…it is higher in women who had an earlier first pregnancy and delivery." This is due to the age at first sexual intercourse resulting in pregnancy. This is evident in a case-control study done in northern Italy and Norway where researchers found that older age at first birth decreased risk for cervical cancer. Furthermore, "studies on cervical cancer have shown that

early activity among adolescents renders the immature cervical epithelium vulnerable to [HPV]." Also, "pregnancy and delivery, particularly at a younger age, may cause cervical erosions that increase exposure to potential [HPV infection]." In the Merrill et al. (2005) review of the literature on maternal age at first birth and cervical cancer a study was conducted among rural Asian women who have had extramarital sexual intercourse. In this cohort, 84% of women with cervical cancer experienced sex before the age of 16 and their risk increased as age at first sexual intercourse decreased. Age at first sexual intercourse is a strong factor for HPV infection and cervical cancer, but it becomes a more significant risk factor when taking into account the number of sexual partners of a woman; however, age at first birth is an interesting variable to consider for cervical cancer.

2.4 Health Lifestyle Theory

William Cockerham created the health lifestyle theory to understand the way individuals conceptualize health within their social environment from four sociological theorists: Max Weber, Georg Simmel, Pierre Bourdieu and Anthony Giddens. Each theorist contributed to the understanding and operationalization of the concepts in the health lifestyle theory diagram. The health lifestyle theory can be summarized as "self-selected forms of status-oriented behavior" or "lifestyles (a set of behaviors) [that] are social practices and ways of living adopted by individuals that reflect personal, group, and socioeconomic identities" (Cockerham et al., 1997). In other words, lifestyles are health behaviors based on choices available to the individual within their life situation. William Cockerham published the health lifestyle theory in 1997 with Alfred Rütten and Thomas Abel; however, no progress has been made using quantitative methods to understand a health phenomenon using this framework.

The health lifestyle theory takes into account the external factors such as socialization and internal factors such as life choices of the individual in relation to health. This theory

includes external and internal components that affect the decisions, actions and repetition of such actions to explain the rational of women risking their health by practicing behaviors that increase their vulnerability to HPV and cervical cancer. External factors include class circumstances, age, gender, ethnicity, collectivities, and living conditions (Cockerham, 2005 & Cockerham et al., 1997). Class circumstances are the "distance from [the] necessity" (Cockerham, 2005). The more distance a person is from financial necessity, the greater the freedom to "taste" as Bourdieu terms the development and refinement of personal likings within the structure of their socioeconomic class. Through class circumstance women adapt to the identity of their social group and adopt their taste consistent with their class position. Age, gender and ethnicity also play a role because older Mexican women's experiences of cervical cancer differ from younger Mexican women's experiences. Collectivities are individuals linked through social relationships such as kinship, work, religious and political groups. For example, through women's collectivities information is passed through social networks and *comadres* or female friends that relay their experiences to one another about a certain topic or issue such as their Pap smear experiences. Living conditions such as quality of housing, access to basic utilities, neighborhood facilities and personal safety are all influential components that structure an individual life chances, or according to Weber "a crystallized probability of finding satisfaction for interests, wants and needs, thus the probability of the occurrence of events which bring about such satisfaction" (Cockerham, 2005). To illustrate, the higher a person is on the class hierarchy the better the person's life chances. Life chances are the representation of influences of structure. Life chances are the probability people have in life because of their social position. The structures that influence life chances are the rules and resources associated with societies, groups and roles that both constrain and enable individuals to act. For instance, a woman is more likely to have a Pap smear screening if she has adequate living conditions, and women in her social

class (e.g. the *comadres*) have talked about the importance of such an exam and it is an action that is consistent with her social class.

Socialization and experiences are influenced by the class circumstances, collectivities, living conditions and age, gender and ethnicity. Socialization (e.g. education) has two categories: primary and secondary. Primary socialization consists of society's norms and values on the individual by a significant other; for example, a mother's emphasis to children on abstinence before marriage. Secondary socialization is learned behavior that comes later in life such as knowledge through an educational institution. Experiences are learned outcomes from day to day activities that come about through social interaction and the practical exercise of agency or life choices. These life choices are "common sense [dictating] that a person would choose health" (Cockerham et al., 1997). The life choices and life chances interplay with choice playing the bigger role that then leads to the habitus. Habitus can be described as "a cognitive map or set of perceptions that guide and evaluate a person's choice" (Cockerham, 2005). Habitus is the central point of the theory because it explains how the individual is able to conceptualize their circumstances within the socialization and individual experiences and social status that shape a person's choice. Habitus fits every situation and is not static but rather "an open system of dispositions that are subjected to and affected by experiences in ways that can either reinforce or modify behavior. Martha Balshem (1991) discusses in her study this concept in a public health campaign to reduce cancer that failed in a working class community because the residents believed cancer was not preventable. Furthermore, "Walsh, Sorensen and Leonard (1995) [stated that] when women's roles expanded…restrictions on their behavior were gradually relaxed and smoking became more acceptable" (Cockerham et al., 1997). These practices or actions are conscious calculations. Following the habitus are risk factors that increase a woman's probability of developing cervical cancer. For example, some of these risk

factors include age at first sexual intercourse and the number of sexual partners. These practices or risk behaviors become health lifestyles. The health lifestyles are calculated choices and are a person's overall pattern of "health- related behavior, values, and attitudes adapted by groups of individuals in response to their social, cultural, and economic environments" (Cockerham et al. 1997). Healthy lifestyles can be replicated or modified through the feedback process, meaning that the person's lifestyles are processed through the habitus to determine whether behavior is accepted or rejected based on life choices, life chances and social status (e.g. socioeconomic status) of the individual. The study of lifestyles helps make sense of what people do, why they do it and what doing it means to them and others. For example, my study identifies actions that contribute to the probability of cervical cancer and it explores the reasons for such behavior but it does not provide evidence about what this behavior means to them and others. However, gender inequalities, access to care, and health literacy can speculate as to why women practice risky behaviors and what this behavior means to them and others using this framework.

Chapter 3: Methodology

The dataset was collected in the summer of 2007 at the General Hospital "Dr. Salvador Zuribran" in Chihuahua City, Mexico. The study was overseen by Dr. Irene Leal, a molecular biology professor at the University of Chihuahua and the principal investigator of the dataset. Women were referred to the Dysplasia Clinic for an abnormality on their Pap smear by their local health clinics. At the time of their visits, a survey was administered by the principal investigator, medical student and me. I was able to access this data because of my admittance to the Minority Health and International Research Training (MHIRT) program at the University of Texas at El Paso. Dr. Robert Anders, the dean of the College of Health Science, and his associates selected undergraduate and graduate students from all disciplines interested in international health research. Individuals were selected based upon bilingual skills in English and Spanish and academic achievements. This grant program was a three year investment to produce health researchers. I was assigned to Dr. Leal at the University of Chihuahua in Chihuahua City (UACH).

The survey is an imitation of Colditz et al. (2000) study of the Harvard Cancer Risk Index that measures individual cancer risk and the strength of association between risk behaviors and cervical cancer. However, the principal investigator Dr. Leal added the Pap smear and Colposcopy exams, and residency of participants. The survey conducted in Chihuahua City failed to feature all variables included in the Colditz and colleagues' (2000) online survey that measured cervical cancer risk. So, Dr. Leal's survey did not mirror the Harvard Cancer Risk online survey.

3.1 Participants

The participants traveled to the dysplasia clinic located in Chihuahua City from different *municipios* across the state of Chihuahua. In this study, 50% of women were living in

Chihuahua City and the other half were spread throughout the state. The women living in *municipios* other than Chihuahua City are observed in Illustration 3.1. A total of 108 women were living in Chihuahua City at the time of the survey as indicated by the darkest color pallet on the map. The women living outside of Chihuahua City are projected by the number of respondents in each *municipio*. The median age for all participants was 39.9 years of age. The respondents ranged in age from 15 to 68 years old. The total number of respondents was 216. In this study, the largest group of women were within ages 25-29 and 45 years and older. The participants have all had a Pap smear at their local health clinic and are coming to the Dysplasia clinic for a definitive diagnosis or appointment for a Colposcopy.

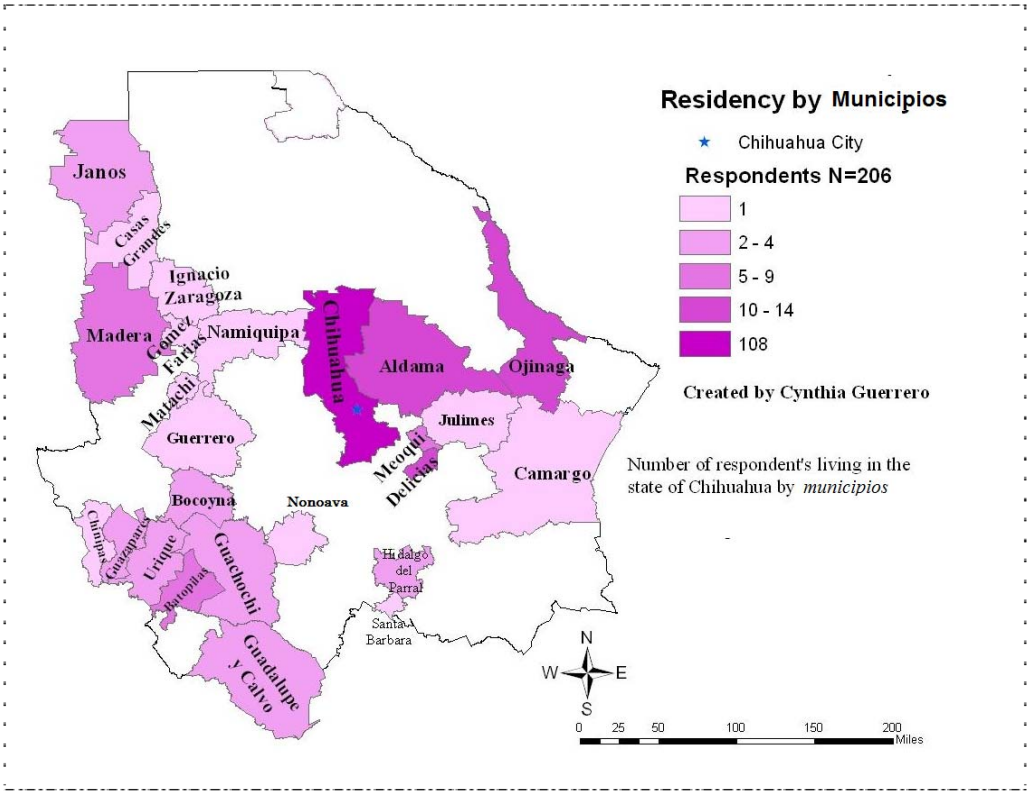

Illustration 3.1: Number of respondents by *Municipios* in Chihuahua State.

Table 3.1 lists the respondent's *municipio* by total population and the percentage of women in each *municipio*. Furthermore, live birth rates are included to compare the urban and rural areas. Chihuahua County has the lowest rate of live births of 2.2 compared to the rural

areas where Namiquipa has the highest live births (3.26) in this area. Batopilas (45%), Urique (40%), and Guachochi (36%) are the *municipios* in the rural areas that have the highest illiteracy percentage of about 30% of the total female population in these three *municipios*.

Table 3.1: List of Respondent's Place of Residency by *Municipio*.

No.	Name of *Municipio*	Total Population	% of females*	Live Births	% females illiteracy**	% female head of house***
1	**Chihuahua**	**758,791**	**35%**	**2.2**	**2%**	**59%**
2	Cuauhtémoc	134,785	35%	2.5	3%	48%
3	Delicias	127,211	35%	2.5	3%	53%
4	Hidalgo del Parral	103,519	36%	2.38	3%	54%
5	Guadalupe y Calvo	51,854	29%	3.19	27%	57%
6	Camargo	47,209	35%	2.57	3%	54%
7	Guachochi	45,881	30%	2.96	36%	40%
8	Meoqui	41,389	34%	2.64	4%	63%
9	Guerrero	37,249	34%	3.05	7%	42%
10	Madera	32,031	33%	3.12	6%	45%
11	Bocoyna	29,907	33%	2.75	19%	57%
12	Ojinaga	21,157	34%	2.85	4%	52%
13	Namiquipa	20,314	35%	3.26	4%	31%
14	Aldama	19,879	34%	2.75	4%	54%
15	Urique	19,566	30%	3.25	40%	51%
16	Batopilas	13,298	28%	3.16	45%	34%
17	Santa Bárbara	10,120	36%	2.73	4%	51%
18	Casas Grandes	8,413	33%	3.07	4%	39%
19	Janos	8,211	30%	3.25	4%	30%
20	Guazapares	8,010	30%	3.2	27%	43%
21	Gómez Farías	7,583	36%	3.21	4%	41%
22	Chínipas	7,471	30%	3.03	15%	40%
23	Ignacio Zaragoza	6,631	35%	3.13	4%	38%
24	Aquiles Serdán	6,212	25%	2.9	3%	56%
25	Julimes	4,507	34%	2.93	4%	37%
26	Matachí	3,169	36%	3.37	5%	46%
27	Nonoava	2,810	32%	3.04	18%	25%

* percent of females ages 15-59

** % Females, 15+yrs, cannot read and write

***% of female head households

3.2 Instruments

The dataset is a measure of risk behaviors in women attending the Dysplasia Clinic located in Chihuahua City. It also included two diagnostic methods: the Pap smear and the

Colposcopy. The risk behaviors included smoking, having a pap smear in the last 3 years, use of oral contraceptives, number of sexual partners, age at first sexual intercourse, having a sexually transmitted disease (besides HPV), pregnancy, live births, abortions, cesareans, and place of residency. In my study, the following variables were excluded: having a pap smear in the last 3 years, abortions and cesareans. Pap smear in 3 years was excluded because women attending the clinic have had a pap smear, but only 6 respondents were able to answer this question correctly and 20 women believed they had not had a Pap smear within the last three years; thus illustrating an understanding of the exam itself. Hence, this was not a good measure of risk behavior. Abortions and cesareans were excluded from the analysis due to no correlation between these variables and cervical cancer or residency. Diagnostic variables are also included in the survey such as actual Pap smear, Colposcopy and histology. In the analysis, histology was excluded due to 85% of missing variables.

3.3 Variable List

In my study, the dependent variables are place of residency, cervical cancer diagnostic methods and the number of live births. Place of residency is where the respondent lived at the time of the survey. The residency in the dataset is identified by *municipio* in Chihuahua State and further dichotomized to be defined as urban and rural areas. The urban area is defined as respondent's living in Chihuahua City. The city of Chihuahua is the second largest city in the state with a total population of 758,791 (INEGI, 2005). The rural area is defined as the 26 rural (semi-urban and rural) towns. This dissection was done because almost half of the respondents live in Chihuahua City (50%) and the rest live in the 26 rural areas (48%) in the state of Chihuahua. One resident did commute from Juárez to the dysplasia clinic in Chihuahua City however; this case was excluded because it was not representative of the cachement area. The rural areas include the following semi-urban and rural towns: Aldama, Aguiles Serdán,

Batopilas, Bocoyna, Camargo, Casas Grandes, Chínipas, Cuauhtémoc, Delicias, Gómez Frías, Guachochi, Guadalupe y Clavo, Guazapares, Guerrero, Hidalgo de Parral, Ignacio Zaragoza, Janos, Julimes, Madera, Matachi, Meoqui, Namiquipa, Nonoava, Ojinaga, Santa Bárbara and Urique.

The second dependent variable is cervical cancer diagnosis and the results are provided by two methods of detection: the Pap smear and Colposcopy exams. The Pap smear is the primary exam for detection of a dysplasia, or abnormality. A vaginal speculum, also known by the women attending the clinic as "el pato" or the duck is inserted in the vagina to look at the cervix. Cells from the cervix are extracted using a cervical brush or wooden scraper. The sample or smear is placed on a glass slide and sent to the laboratory for examination (Quijada, 2006). The results of the Pap smear take from one month to three months. The majority of the women attending the Dysplasia clinic are given the Colposcopy exam. The Colposcopy method of diagnosis magnifies the cervix to see any physical lesions using an acetic acid solution that when applied to the cervix will color any lesion white. These two diagnostic results use 1968 original division of the Bethesda system: cervical intraepithelial neoplasm grades 1, 2 and 3 (Sellors & Sankaranarayanan 2003). According to Burd (2003), "CIN 1 and CIN2-CIN3 are distinct processes, with CIN 1 indicating a self limited sexually transmitted HPV infection and CIN 2 or CIN 3 being the true cervical cancer precursor." My study will be using the 1991 version of the Bethesda system (TBS) of squamous intraepithelial lesions that are classified into two grades. The low squamous intraepithelial lesions (LSIL) are CIN 1; also known as pre-cancerous. The high grade squamous intraepithelial lesions (HSIL) are CIN 2 and 3; also known as invasive cervical cancer. The dataset projects results in the CIN categories but in this study the classifications will be pre-cancerous lesions (LSIL) and invasive cervical cancer (HSIL). Again, women diagnosed with a CIN 1 are classified as having pre-cancerous lesions and women

diagnosed with CIN 2 and 3 are labeled invasive cervical cancer in my study. These results will be compared to risk behaviors and between urban and rural areas.

The independent variables are six risk behaviors that include sexually transmitted diseases (STD), oral contraceptive use (OC), smoking, number of live births, age at first sexual intercourse and number of sexual partners. The independent variables are dichotomous because the survey provided each variable with two categorical answers. Dr. Leal used the online survey of estimating individual risk for cervical cancer that provided easy to answer questions from Colditz et al. (2000). These authors created a survey on their website to assess individual risk at www.yourdiseaserisk.com. However, Colditz et al. (2000) wrote an article that examines the variables used in the online survey called the Harvard Cancer Risk Index. According to the authors, "for simplicity of administration, and ease of self-completion, continuous or ordered variables have usually been dichotomized" despite the limitation when analyzing the variables for an accurate projection of risk behavior. For example, sexually transmitted disease, the use of oral contraceptives and smoking are operationalized as a yes or no response only. Age at first sexual intercourse and number of sexual partners are also dichotomous with the former asking respondents whether she was younger than 16 or older than 17 years at first intercourse and the latter asking women if she has had six partners or fewer or more than seven. In addition, apart from these dichotomous variables the Harvard Cancer Risk Index online survey includes the following variables: age, a previous diagnosis of cancer other than skin cancer, the primary method of birth control is condoms or diaphragms; and the realization of the Pap smear exam in the last 3 years.

Table 3.1 shows the dependent variables are the Pap smear and Colposcopy diagnostic results and residency by *municipios*. The Pap smear exam was performed before the women attended the Dysplasia clinic, and the Colposcopy is the exam that was done at the time of the

appointment. The majority of the women in the sample had both exams results. The results are measured as 0 and 1. The pre-cancerous group (0) is a result of the first stage of cervical intraepithelial neoplasm. Invasive cervical cancer (1) is the group of women detected with the second and third stage of cervical cancer. Respondent's *municipio* was difficult to identify because some respondent's used colonia names, or names that label a neighborhood rather than a *municipio*. However, people with *municipios* not able to be identified were excluded from the study for the purpose of unknown location. This variable is measured as urban and rural. Respondent's living in Chihuahua City were labeled urban and all other respondent's were labeled rural due to the size of population and number of respondents in each category. This city is the largest in the state of Chihuahua except for Cuidad Juárez; however, the single case in Juarez was eliminated for categorical purposes. The independent variables are categorized as strong and weak association to cervical cancer. The strong association risk behaviors are the number of sexual partners categorized as 6 partners or fewer versus more than 6; age at first sexual intercourse separated at the age of 16; and the number of live births is separated into 0 to 2 and 3 or more. The range of live births was from 0 to 13 children, however. The weak association risk behaviors consist of oral contraceptive use, sexually transmitted diseases other than HPV, and smoking. These variables were simply split into yes or no groups.

Table 3.2: Variable Names, Operations and Metrics, 2007, Risk Behavior Survey (N=216).

Name	Operation	Metric
Dependent Variable		
Diagnostic methods	Pap Smear and Colposcopy	0=pre-cancerous; 1=invasive cervical cancer
Residency by *Municipio*	Urban and Rural areas	0=Rural; 1=Urban
Independent Variable		
Strong Association Risk Behaviors	Number of sexual partners	0=6 or less; 1=more than 6
	Age at first sexual intercourse	0=16 yrs or less; 1=17 yrs. or older
	Live births	0=0-2; 1=3 or more
Weak Association Risk Behavior	Oral contraceptive use	0=no; 1=yes
	sexually transmitted disease	0=no; 1=yes
	Smoking	0=no; 1=yes

Depending on the research question, these variables were compared to independent variables that include the six risk behaviors, cervical cancer diagnostic method results and place of residency by urban and rural areas. For instance, when the Pap smear and Colposcopy diagnostic methods were dependent variables, the following risk behaviors were independent: smoking, age at first sexual intercourse, number of sexual partners, sexually transmitted disease, oral contraceptive use, number of live births and urban and rural areas. All variables were dichotomous except the number of live births that was also analyzed as a continuous variable. Furthermore, when rural and urban was a dependent variable, the six risk factors and cervical cancer diagnostic exams (Pap smear and Colposcopy exams) are independent. Finally, when the number of live births was a dependent variable the independent variables were the five risk behaviors. The number of live births in this analysis is dichotomized into women with 0-2 live births (0) and women with 3 or more live births (1) for the purpose of this analysis.

3.4 Statistical Techniques

In order to answer the research questions, bivariate and multivariate logistic regression analysis were performed with cervical cancer results and residency by *municipio* as the dependent variable and risk behaviors as the outcomes. Then, I selected the most important predictor (i.e., live births), and used this as another dependent variable. In this analysis, the other risk factors and residency by *municipio* became the independent variables. Furthermore, a difference of means t-test independent pair was conducted to analyze the differences between rural and urban areas in relation to risk behaviors. Data were analyzed using the statistical software package SPSS.

Chapter 4: Results

4.1 Descriptive Statistics

The frequencies for strong and weak independent variable totals and percentages are displayed in Table 4.1 and Table 4.2. Respondents were three times more likely to indicate no smoking, no oral contraceptive use and no sexually transmitted diseases other than HPV.

Table 4.1: Weak Association Risk Factors-Independent Variables.

Weak Risk Variables	**Smoking**	**oral contraceptive use**	**STD**
No	151 (70%)	166 (77.9%)	184 (85.9%)
Yes	64 (29.7%)	47 (22.1%)	30 (14%)
Total	215	212	214

The independent variables in Table 4.2 were more sensitive in nature than the questions in Table 4.1. However, the majority of the respondents answered as having fewer than 6 partners and beginning sexual activity at age seventeen or older. To illustrate, 67.4% of women were 17 years and older at the time of first sexual relations and 94.8% of women appeared to have fewer than 6 sexual partners in their lifetime.

Table 4.2: Strong Association Risk Factors-Dependent Variables.

Age at first sex contact	Frequency	**# of sex partners**	Frequency	**live births**	Frequency
≥16	70 (32.5%)	**6 or fewer**	201 (94.8%)	**0-2**	118 (54.6%)
16+	145 (67.4%)	**7 or more**	11 (5.1%)	**3+**	98 (45.3%)
Total	215	**Total**	212	**Total**	216

Table 4.3 describes the cervical cancer diagnostic exams: Colposcopy and Pap smear in a cross tabulation. 11.3% of women who were diagnosed as having invasive cancer by Colposcopy were diagnosed as having precancerous lesions by Pap smear. Conversely, another

11.3% of women diagnosed as having invasive cancer by Pap smear were diagnosed pre-cancerous by Colposcopy. There was agreement between the two diagnostic methods 88% of the time for both precancerous and invasive diagnoses.

Table 4.3: Colposcopy and Pap Smear Diagnostic Exams.

Colposcopy	Pap Smear **Pre-cancerous**	**Invasive Cancer**	**Total**
Pre-cancerous	61	9	70
Invasive cancer	9	71	80
Total	70	80	150

4.2 Predicting a Pap Smear Diagnostic Result

In the bivariate analysis between Pap smear result and the risk behaviors, the number of live births was the strongest variable predictor with a significance value of 0.002. Women with three or more live births were at an increased risk for cervical cancer according to their Pap smear results. All other variables in Table 4.4 are not statistically significant.

Table 4.4: Bi-variate Analysis: Pap smear Diagnostic Result and Risk Behaviors.

Model	**Risk Behavior**	B	Sig.	Exp(B)	R-square
Model 1	Smoking	-0.216	0.516	0.806	0.046
	Constant	-0.061	0.728	0.941	
Model 2	Age at first sexual intercourse	-0.329	0.3	0.72	0.066
	Constant	0.102	0.696	1.107	
Model 3	Number of sexual partners	0.363	0.598	1.438	0.023
	Constant	-0.14	0.361	0.87	
Model 4	Sexual transmitted disease	0.262	0.557	1.3	0.053
	Constant	-0.175	0.269	0.839	
Model 5	Oral contraceptive use	-0.399	0.281	0.671	0.073
	Constant	-0.071	0.674	0.932	
Model 6	Living in urban area	0.071	0.813	1.073	0.035
	Constant	-0.158	0.459	0.854	
Model 7	Number of live births (dichotomous)	0.961	.002**	2.614	0.25
	Constant	-0.575	0.006	0.563	

** p < .05, *p<.10

Table 4.5 presents the statistical association between the Pap smear diagnostic result and the six risk behaviors including location. The number of live births dichotomized (0-2 and 3 and more) resulted in a statistically significant increase in odds of invasive cancer as measured by a Pap smear result. Again, women with more than three live births were more likely to be diagnosed with cervical cancer when evaluating their Pap smear results. One of the independent variables, live births, was originally collected as continuous variables and later dichotomized in the multiple logistic regression model. I ran the model again with this variable entered as continuous and found that the number of live births was statistically significant at 0.003. When live births was coded in a more elaborate categorical way (0, 1-2, 3-5, 6 or more), I found that women who had 6 or more children were 7.5 times more likely to be diagnosed by Pap smear with invasive cancer, compared to women with no live births. In answer to the first research question: Which risk factors are statistically associated with irregular Pap smear result? Which are most important? The number of live births is the most important and only significant predictor of a cervical cancer diagnosis according to the Pap smear results.

Table 4.5: Logistic Regression: Pap Smear Diagnostic Result and Risk Behaviors.

Models	**Risk Behaviors**	**B**	**Sig.**	**Exp(B)**
Model 1	Smoking	-0.274	0.458	0.76
Model 2	Age at first sexual intercourse	-0.418	0.234	0.658
Model 3	Number of sexual partners	0.447	0.572	1.563
Model 4	Sexual transmitted disease	0.486	0.328	1.626
Model 5	Oral contraceptive use	-0.408	0.315	0.665
Model 6	Living in urban area	0.127	0.695	1.136
Model 7	Number of live births (dichotomous)	1.053	0.001**	2.867
	Constant	-0.342	0.404	0.71
	Cox & Snell R Square	0.034		
** p < .05 *p<.10	Nagelkerke R Square	0.046		

4.3 Predicting a Coloposcopy Diagnostic Result

Table 4.6 presents a bivariate analysis between the Colposcopy result of cervical cancer and risk behaviors. The table features two significant variables: women living in an urban area and the number of live births as significant at the p-value of .10. Women living in rural areas are at a higher risk for cervical cancer. Women with three or more live births increased their risk for cervical cancer suggested by the Colposcopy. Other variables to consider that are nearly significant are early age at first sex (0.131) and the use of oral contraceptives (0.152). Women initiating sexual intercourse at 16 years and younger and not using oral contraceptives are at a higher risk for cervical cancer. All other variables are not significant for discussion.

Table 4.6: Bi-variate Analysis: Colposcopy Diagnostic Result and Risk Behaviors.

Model	**Risk Behavior**	B	Sig.	Exp(B)	R-square
Model 1	Smoking	0.274	0.403	1.316	0.007
	Constant	-0.274	0.118	0.76	
Model 2	Age at first sexual intercourse	-0.478	0.131	0.62	0.062
	Constant	0.134	0.606	1.143	
Model 3	Number of sexual partners	0.708	0.343	2.03	0.048
	Constant	-0.197	0.197	0.821	
Model 4	Sexual transmitted disease	-0.446	0.367	0.64	0.047
	Constant	-0.173	0.272	0.841	
Model 5	Oral contraceptive use	-0.533	0.152	0.587	0.116
	Constant	-0.086	0.612	0.918	
Model 6	Living in urban area	-0.521	.085*	0.594	0.072
	Constant	0.022	0.917	1.022	
Model 7	Number of live births (dichotomous)	0.494	.099*	1.639	0.115
	Constant	-0.422	0.038	0.656	

**p<.05, * p < .10

Table 4.7 presents results from a logistic regression predicting Colposcopy results with risk behaviors. In this analysis, the number of live births was again a significant predictor of invasive cancer. Living in urban areas and early age at first sexual intercourse were nearly

significant at p=0.15 and p=0.16 respectively. Women with three or more live births were statistically significant at 0.099 as a dichotomous variable (0-2 and 3 and more). However, live births categorized as 0, 1-2, 3-5, and 6 and more, Colposcopy diagnosis of invasive cancer decreased the risk to 3.0 (p=.082). Women living in an urban area have a lower risk for cervical cancer. Women using oral contraceptives and began having sexual intercourse after age 17 are at a lower risk for cervical cancer; however, women who have three or more live births are at a higher risk for cervical cancer according to the Colposcopy results. In answer to the second research question (Which risk factors are statistically associated with positive Colposcopy result?), the only factor significant at the .05 level was live births; it was the strongest predictor in the regression model in relation to the Colposcopy result.

Table 4.7: Logistic Regression: Colposcopy Diagnostic Result and Risk Behaviors.

Models	Risk Behaviors	B	Sig.	Exp(B)
Model 1	Smoking	0.053	0.884	1.055
Model 2	Age at first sexual intercourse	-0.482	0.15	0.618
Model 3	Number of sexual partners	1.034	0.239	2.811
Model 4	Sexual transmitted disease	-0.287	0.603	0.751
Model 5	Oral contraceptive use	-0.521	0.201	0.594
Model 6	Living in urban area	-0.447	0.16	0.639
Model 7	Number of live births (dichotomous)	0.609	0.06*	1.839
	Constant	0.097	0.809	1.102
	Cox & Snell R Square	0.034		
** p < .05 *p<.10	Nagelkerke R Square	0.046		

4.4 Predicting Live Births

Table 4.8 presents a bivariate analysis with live births as the dependent variables and the other five risk behaviors including location as independent variables. The live births variable was dichotomized for this analysis into 0 to 2 birth and 3 or more live births. Age at first sexual intercourse (0.197) and living in an urban area (0.136) were nearly significant when the number of live births became the dependent variable. Women older than 17 years old at first sexual

intercourse and living in urban areas were less likely to have three or more births. No statistically significant variables were present in predicting live births.

Table 4.8: Bi-variate Analysis: Number of Live Births and Risk Behaviors.

Models	Risk Behaviors	B	Sig.	Exp(B)	R-square
Model 1	Smoking	0.253	0.398	1.288	0.058
	Constant	-0.253	0.123	0.776	
Model 2	Age at first sexual intercourse	-0.377	0.197	0.686	0.088
	Constant	0.057	0.811	1.059	
Model 3	Number of sexual partners	0.789	0.219	2.202	0.086
	Constant	-0.23	0.106	0.795	
Model 4	Sexual transmitted disease	-0.275	0.493	0.76	0.047
	Constant	-0.131	0.377	0.878	
Model 5	Oral contraceptive use	-0.368	0.277	0.692	0.072
	Constant	-0.109	0.484	0.897	
Model 6	Living in urban area	-0.413	0.136	0.662	0.103
	Constant	0.038	0.845	1.039	

** p < .05, *p<.10

The number of live births was the most important risk behavior for cervical cancer results in both methods of diagnosis: the Pap smear and Colposcopy. The number of live births was put into the logistic regression model as a dependent variable to seek risk behaviors and location variables that can explain this relationship. In this model (Table 4.9) oral contraceptive use (p=.19) and living in an urban area (p=.15) are the most important factors in explaining the number of live births. In this case, oral contraceptive use and living in an urban area decreases one's odds of having three or more live births. The third research hypothesis has been answered; according to the strongest risk factor (i.e. live births). The most important risk factors have been identified to explain the number of live births as a strong indicator for cervical cancer diagnosis.

Table 4.9: Logistic Regression of Live Births.

Models	Risk Behaviors	B	Sig.	Exp(B)
Model 1	Smoking	0.279	0.386	1.321
Model 2	Age at first sexual intercourse	-0.249	0.425	0.78
Model 3	Number of sexual partners	0.54	0.433	1.716
Model 4	Sexual transmitted disease	-0.251	0.561	0.778
Model 5	Oral contraceptive use	-0.474	0.19	0.623
Model 6	Living in urban area	-0.415	0.15	0.66
	Constant	0.253	0.438	1.288
	Cox & Snell R Square	0.034		
** p < .05 *p<.10	Nagelkerke R Square	0.046		

4.5 Differences Between Urban and Rural Areas

The difference of means t-test for an independent sample analysis (Table 4.10) was done to measure the difference between urban and rural areas according to the risk behaviors, and cervical cancer diagnosis. There were three significant differences that emerged from this test. First, thirty-eight percent of those living in an urban area had cervical cancer, while the percentage jumped to 51% for those living in rural areas according to Colposcopy results. The Pap smear exam results showed no significant difference between urban and rural areas. The number of sexual partners and the number of live births as a dichotomous variable (0-2 and 3+) were also significantly different between these two locations. Second, three percent of women with more than seven sexual partners living in urban areas had cervical cancer compared to eight percent of rural women. There was a very small gap between urban and rural areas for the number of sexual partners; despite its p-value of .10. Third, 41% of women living in urban areas were diagnosed with cancer compared to 51% of women living in rural areas. In this analysis, the fourth research question (How do risk factors, Colposcopy and Pap smear result vary between urban and rural locations?) was answered. Colposcopy results was significantly different; number of sexual partners and live births as a dichotomous variable were nearly

significant, while Pap smear exams, sexually transmitted diseases, oral contraceptive use, age at first sexual intercourse, and smoking were not significant.

Table 4.10: Difference of Means T-test Independent Sample.

Risk Behaviors	Residency	N	Mean	Std. Deviation	Std. Error Mean	Sig. (2-tailed)
Number of live births (dichotomous)	urban	108	0.41	0.494	0.048	0.137
	rural	104	0.51	0.502	0.049	
Sexual transmitted disease	urban	107	0.17	0.376	0.036	0.287
	rural	103	0.12	0.322	0.032	
Age at first sexual intercourse	urban	108	0.69	0.467	0.045	0.701
	rural	103	0.66	0.476	0.047	
Number of sexual partners	urban	107	0.03	0.166	0.016	.100*
	rural	101	0.08	0.271	0.027	
Oral contraceptive use	urban	106	0.24	0.427	0.041	0.488
	rural	102	0.2	0.399	0.04	
Smoking	urban	107	0.31	0.464	0.045	0.532
	rural	104	0.27	0.446	0.044	
Colposcopy Diagnostic Results	urban	90	0.38	0.488	0.051	.084*
	rural	91	0.51	0.503	0.053	
Pap Smear Diagnostic Results	urban	92	0.48	0.502	0.052	0.814
	rural	89	0.46	0.501	0.053	

** $p < .05$, *$p<.10$

A frequency distribution of live births revealed that 55% of the sample had two or fewer births and the distribution was positively skewed. Therefore, the number of live births is shown in the analysis as a dichotomous variable (0-2, 3+). However, in order to view the percent distribution of live births and *municipios*, a cross tabulation for the categorical live births variable (0, 1-2, 3-5, and 6+) and urban and rural areas was created in Table 4.11.

Table 4.11: Live Births and Residency.

Live births	Urban	Rural
0	47.50%	47.50%
1-2	41.70%	30.80%
3-5	31.50%	38.50%
6+	9.30%	12.50%

Chapter 5: Discussion, Conclusion, Limitations and Future Research

I was accepted into the Minority Health International Research Training (MHIRT) program in the summer of 2007 in Chihuahua City. I was assigned to Dr. Leal's study of cervical cancer at the general hospital. She thought I was a nurse and would be able to get clinical practice at the hospital with the gynecologists; however, to her surprise I wasn't. The first time I met Dr. Leal she described the research project beginning with the collection of samples from biopsies conducted at the hospital. She explained the molecular techniques she was using and after her detailed lecture, she asked if I had any questions. I shyly smiled and asked "What is a biopsy?" The look on her face spoke volumes about our different backgrounds.

I felt as if I were in a job interview for the next half hour describing how I came to be in her office through the MHIRT program. She sat quietly listening intently and as I described in depth my skills as a sociologist. I could see her hesitance and wondered if she had a place for me where I could use my skills in her clinical project. She then enthusiastically shared with me the questionnaire of which she had just made copies. As I looked over the one page questionnaire I was surprised that it was very limited. I asked who had helped her with the survey and was guided to the Harvard online survey. I politely offered some suggestions to improve the questionnaire but it was not possible. The project was on a budget and copies had already been made for 300 individuals to fill out. I was disappointed that I was not able to help with improving the questionnaire but as I began to create a spreadsheet for the data I suggested some changes that were taken into account based on the confusion of choices to some questions. My job became to deal with the dataset and its many problems. I had to figure out how to measure individual cancer risk and was not aware of the Harvard Cancer Risk Index article by Colditz et al. (2000) until I was searching for background information on cancer risk analysis.

But by then the questionnaire was being used and I had to create a risk scale according to the variables in the survey.

My assignment was to orient myself the first week in the clinical setting. I was going to be working with a first year medical student who would be dealing with the biopsy samples provided by the gynecologists and I would collect the data. I was a first year graduate student during the data collection. I struggled daily to understand the clinical terminology because most of the information provided was written for molecular biology professors and clinicians. I had very little understanding about the specific mechanics of the disease and had to learn the clinical terminology in Spanish included in the questionnaire. I read all of the pamphlets given to the women at the clinic on cervical cancer and HPV for easy to understand information but most of the pamphlets provided statistical information about the disease.

I worked at the clinic with the gynecologists and learned the instruments used in a Colposcopy exam and I was able to see the exam done. All of my medical knowledge was in Spanish, the male gynecologist that usually worked at the clinic when I was attending in the evenings was very helpful in quizzing my ability to understand the name of each instrument and how the Colposcopy exam was conducted. I felt as a first year student in clinical practices without the theory or background. In the three months of my stay I learned the clinical process from the doctor's office to the laboratory techniques used on samples collected.

5.1 Discussion

The medical limitations of the data are significant because the questionnaire only measures risk behaviors between rural and urban areas and the majority of the risk behaviors are dichotomized. A woman's potential risk for cervical cancer cannot be adequately explained by her risk factors alone, a woman's culture is helpful to interpret why high rates of cervical cancer exist in Mexico. Mexican woman's culture consists of but are not limited to social networks

(e.g. *comadres*, or female friends), perceptions about their body and its functions, attitudes toward health care providers, and their position within their family and society. These factors are difficult to measure in a survey but influence a woman's risk for cervical cancer.

My data focus largely on the sexual behavior aspects. The age at first sexual intercourse, the number of sexual partners, sexually transmitted disease excluding HPV, oral contraceptive use and the number of live births are all clues about sexual activity that increases risk of HPV infection, a precursor for cervical cancer. Sexual activity is the primary source for HPV infection and such behaviors increase risk of HPV over time. The health lifestyle theory helps to understand these risky behaviors. Identities are part of a woman's culture that are communicated through religion and the media and reinforced through social networks, socialization and experiences. To illustrate, cultural beliefs and attitudes can be conveyed through religious beliefs and the media, or mainstream society. These two avenues of cultural perspectives can be communicated through collectivities, or individuals linked through social networks such as family, friends, co-workers, schools, and communities (Cockerham et al., 1997). Socialization (i.e. education) and experiences are also different channels of communication as compared to social networks. Primary socialization is an idea shared by one person to another through gossip and word of mouth. For instance, a woman relaying her experience of cancer or heard about someone with cervical cancer and relays the incidence to another. Secondary socialization is an idea about behaviors taught in school and by religious organizations. To illustrate, the Catholic Church in Mexican culture emphasizes sex after marital commitment. Experiences are daily lessons that are learned; for example, a woman's experience of a Pap smear or attending a health clinic. Socialization and experiences are influential factor for women's risky behaviors. Risk behaviors are a reflection of personal, group, and socioeconomic status identities (Cockerham et al., 1997). The complexity of a woman's culture or identity can be outlined in the health lifestyle

theory to better evaluate screening programs and create culturally relevant educational programs that will be effective and useful to woman.

Sexual intercourse outside the marriage is taboo in the Mexican culture and may be based upon religious beliefs. These messages are strongly communicated through family because the household unit in Mexican culture is the most influential. However, the media also plays a role by projecting sexual activity at a young age as an acceptable practice through television, movies, music, and the internet. Furthermore, a woman's choice is also influenced by the education provided by primary and secondary educational sources including a woman's experience. Although educational health classes may provide sex information to students such as protective barriers to prevent STDs and pregnancy, woman relaying their personal experiences about an STD such as HIV to other woman has a more powerful impact on sex behavior change. The message become intimate and real compared to telling woman the more sexual partners, and early age at first sexual intercourse the higher the risk for HPV that can possibly lead to cervical cancer.

The risk factors in this study are directly associated with cell transformation and not only indications of sex activity. In the literature, the following risk behaviors (more live births, oral contraceptive use and sexually transmitted diseases) can cause cells to become cancerous with the length of time to exposure. For example, the more children a woman delivers, the higher the risk for cervical cancer because hormones change after labor may alter the immune response to HPV (Castallsagué et al., 2000). Also, Bernal et al. found that women using oral contraceptives within five years or more, the higher the risk for cervical cancer especially if woman has HPV. Also, women with HPV and an STD (HIV or Gonorrhea) were at a higher risk for cervical cancer compared to only HPV or HIV. Not only are these risk behaviors linked to cell transformation but all three are hints to the absence of condom use that protects against STDs.

Negotiating condom use is later discussed in the chapter. The age at first sexual intercourse and the number of sexual partners are risks when taken into account length of exposure. For instance, the younger a woman has sex with many partners the higher the risk for HPV infection and cervical cancer.

The results of this study cannot be understood as either positive or negative lifestyle because all of the women in the sample are predicted to have a negative health lifestyle. They are all at a high risk for cervical cancer but some women more so than others. External influences such as health literacy, access to care and gender inequality are all factors that affect women's habitus or cognitive map of decisions made such as whether or not to practice risky behavior. These risk behaviors are limited in a sociological model of health; however, absent variables to consider such as socioeconomic status, cultural beliefs about the body, partner's age communication between women and gynecologists, and the health care system are external factors that will provide a macro-perspective sociological explanation for risk behavior outcomes. Even though the variables in the study do not completely piece together the health lifestyle theory it is still useful in projecting risk behavior practices and health lifestyle outcomes based upon speculated external factors. These additional variables will be discussed within the health lifestyle model.

5.2 Conclusion

In Mexico, the government created a national cervical cancer screening program in 1974 but it has had a minimal effect. It also established prevention and management guidelines and equipment and facilities for sample testing (Lewis, 2004). In this study, limitations exist but much can be learned by what is not presented in the analysis. Three themes encircle women's culture: health literacy, access to care and gender inequality. These cultural themes are important to understand why high rates of cervical cancer exist in Mexico and what can be done

to decrease women's risk of cancer. Identifying variables that were not available in the questionnaire is a contribution to the literature and viewing these variables through a sociological perspective will unravel how cultural factors influence women's risk behaviors that may result in cervical cancer.

Health literacy can be defined as a woman's perceptions about her body and how it functions, her education level, and verbal and written communication between women and health care providers. Education has an impact on women's understanding about their bodies and how it works. Education is communicated in two forms: primary and secondary socialization. Primary socialization is information learned from a significant other such as a parent or husband. School health curricula, community outreach programs and health fairs are all part of secondary socialization by institutions. A woman's educational status is based on the class circumstances, or social position. The communication between physicians and women through doctor appointments or pamphlets are based on women's level of education. Low economic status and the lack of good communication influence a woman's life choices, or common sense decisions about risk behaviors and life chances, or the likelihood of an action based on economic means. Health literacy enables women to decide on an action based on their socialization or background experiences but limits their actions within an enclosed cachement of social structure framed by social networks, and class circumstances, or the distance from financial necessity. Also, it is important to identify women's perceptions and taboos about the body that create a barrier for screening programs to work. These points of view can also be explained through access to care facilities.

Access to care is the availability of health care services and the type of health care assessable to women. Women living in urban areas have easier access to health facilities than women living in rural areas. In the sample, the Colposcopy exam diagnosed more cervical

cancer in rural areas (51%) than in urban areas (38%). The difference in the Colposcopy exam might be because the length of time between the Pap smear exams conducted at the local health clinic in relation to the Colposcopy exam done at the Dysplasia clinic in Chihuahua City. Factors such as a long wait for an appointment or lack of transportation to the dysplasia clinic; therefore, depending on the diagnosis cells may have progressed into a more progressive grade of squamous intraepithelial lesions. These factors are structural problems that are present before a woman decides to go to the clinic. Many, I presume are not able to attend because of financial constraints, transportation issues, or communication issues between physicians and women. Women not understanding the gravity of HPV and its link to cervical cancer progression without treatment or a follow-up exam such as a Colposcopy are barriers that influence a women's agency to choose whether to attend the clinic or not. The health clinics that refer the women to the dysplasia clinic may provide technical information about barriers methods such as condoms and oral contraceptives to protect against sexually transmitted disease and pregnancies that limit the usefulness of the valuable information given verbally or in writing. Identifying the educational level of women, communication barriers are factors that need to be addressed in future research to decrease the rates of cervical cancer in Mexico.

Gender inequality in women's relationship to their partners, physicians, economic and education levels are external factors that influence a women's choice, or lack thereof, to practice risky behaviors. These gender inequalities are important in understanding women's risk behaviors because women are usually not able to control them. These inequalities exist based on structures (patriarchal relationship, educational opportunity, and the information presented by physicians to women in clinics) that influence women's chances of making a decision about their behaviors. Negotiating in a patriarchal relationship is difficult for women with a lower education than their partners in a traditional Mexican household. Women with less education are less

likely to take the initiative to negotiate condom use or any type of birth control method to prevent pregnancy or sexually transmitted disease because of the underling implications of the questions. For example, a 20 year old Mexican female has been taught the traditional values of the culture and religious beliefs that advocate for women to be content with the number of children she has been given by God. The idea of asking or demanding her partner to use condoms raises a question of fidelity from the woman to the man. Understanding these cultural issues will allow for programs to focus on ways for women to negotiate these dangerous territories in relationships. The socialization and the experiences of women play a major role in negotiating condom use and deciding whether to use oral contraceptives within the structure of gender inequalities and economic status. Women with lower education and income levels are less likely to ask physician questions in the appointment and about any information that may be provided for any number of reasons, including embarrassment. Older women may be less inclined to ask about what is going on in their bodies because their physician is male. Women may feel uncomfortable talking about their bodies with female nurses and physicians. The level of grammar used in the written information on cervical cancer may be too technical and not very visual. Physicians may not take the time to explain basic body functions to their patients or specify how behaviors and conditions (e.g. number of partners and HPV) are linked to cervical cancer.

5.3 Limitations

The limitations of the study are noteworthy for future improvements. First and the most important is the limitation of the population under study. All participants had a Pap smear and were referred to the dysplasia clinic. At the clinic, the majority of the women were given a Colposcopy exam and only a small percentage of women had only a Pap smear or Colposcopy result. There were no “normal” control groups for comparison in order to understand risk

behavior within this sample of women compared to the general population of women in Chihuahua.

Second, the dichotomous variables limit our interpretation of the risk factors and what they tell us about the behaviors of the women. The survey conducted by Dr. Leal was an imitation of the Harvard Cancer Risk Index (HCRI) online survey by Colditz et al. 2000; however, the survey did not accurately portray all the variables. For instance, Dr. Leal's survey does not include socioeconomic status variables such as partner circumcision and barrier methods (condoms or diaphragms) apart from oral contraceptives. Also, variables that were continuous on the Harvard online survey were made dichotomous on our survey. For instance, multiple sex partners and age at first sex were continuous variables; however, Dr. Leal's survey dichotomizes sex partners into 6 or fewer and more than 6 partners and age at first sex is divided into younger than 16 and older than 16. Moreover, these categories were confusing because women at the borderline could be projected into either category; however, verbal agreements at the beginning of the study were made to fix this uncertainty.

Third, some variables in the Harvard online survey were not included in Dr. Leal's survey of risk behaviors. Dr. Leal's study did have the advantage of having a clinical diagnosis to pair with the risk factors. The online risk survey was developed to assess risk, not provide a clinical diagnosis. Another limitation of Dr. Leal's survey is a translation of the Harvard online survey to the interview given to the sample of women. Translation from one language to another is always fraught with potential problems. People who have access to the internet to take an on-line survey are likely wealthier and more educated than women living in the state of Chihuahua, especially rural women. Also, additional variables should be included for future research that was not in either survey. For example, marital status, type of health insurance, cultural beliefs about sex, how women arrived at the clinic, socioeconomic status, including housing conditions

and access to utilities, condom use or other barrier methods to prevent sexually transmitted disease and pregnancy. For future research it is important to understand the external components such as housing conditions in the health lifestyle theory that influence risk behaviors. To illustrate, Lewis (2004) describes how "women who resided in good housing had a Pap smear coverage rate four times greater than those who lived in poor physical conditions" (14). These external influences are barriers that should be addressed to better understand the high incidence and mortality rates of cervical cancer in Mexico and Chihuahua State.

Fourth, an interesting variable to consider for future research is men's perspective of the human papillomavirus and cervical cancer. McPartland et al. (2005) addresses the perceptions of HPV from a male's point of view. Identifying men's perception about HPV infection can create a new opportunity for future research in HPV vaccine and detection programs focused on men. A vaccine exists and is targeted to women but not for men. A vaccine in conjunction with educational programs for both sexes would be important to inform the public about HPV and confront the cultural barriers and lack of knowledge that are evident in developing countries such as Mexico. Education is important in combating these barriers; however, according to Shepherd et al. (2000), these risk behavior education programs are empty without "small group discussion sessions led by peer educator in which a variety of media are used" (687). Lessons learned from experiences portrayed by women and men similar to the population of study characteristics provide a tool of success in conveying health messages.

5.4 Future Research

In order for mortality rates of cervical cancer in Mexico to decline, research should focus on culturally relevant cervical cancer information. This information should include group discussions with peer woman, basic illustrations of bodily functions, and culturally competent. In addition, creating better quality cervical cancer screening exams and treatments would allow

for women to be diagnosed at an earlier stage and treatments given would be more effective. Future research projects should also include both clinicians and sociologists in the design phase. Factors that describe a woman's situation more comprehensively such as economic status, health literacy, access to care and gender inequalities are critical. Even though cervical cancer is a women's issue, men should be included in understanding their knowledge, and perceptions of behaviors with regard to women. In order to combat HPV infection that is linked to cancer, creating a surveillance system for HPV infection is important to consider. Also, understanding men and women's perceptions about the HPV vaccine should be explored because men are carriers of the human papillomavirus through sexual intercourse. Also, identifying non-sexual types of transmission of HPV may lead to future availability of HPV detection tests for men without stigmatizing them and preventing men with physical symptoms of HPV infection to get treatment.

Power inequalities between social scientists and physicians have for many years, obstructed our knowledge of behavioral factors associated with illness and disease. Clinicians are likely to belittle sociologists and anthropologists in favor of a narrower, medical perspective, with little change of either changing human behavior or improve structural inequalities in society. The comprehensive understanding of women's lives can best be achieved through qualitative ethnographic interviews; survey research will never achieve this goal.

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Curriculum Vita

Cynthia Guerrero was born in Corpus Christi, Texas on July 20, 1984. The youngest of three daughters of Jesus and Esperanza Guerrero Jr., she graduated from Moody High School, Corpus Christi, Texas, in the spring of 2002 and entered Del Mar Community College in the fall. After three semesters, she transferred to the University of Texas at El Paso to pursue a bachelor's degree in sociology in the spring of 2004. While pursuing a bachelor's degree, she worked for the Visiting Nurses Association with the Bereavement Counselor in Hospice during 2005 and worked for the director of the Center of Aging in 2006. During this time, she published *Let audiobook sharpen your mental skills* in the June 2006 issue of the El Paso Times. After graduating magnum cum laude with a bachelor's degree in sociology in 2006, she entered the Graduate School at The University of Texas at El Paso in sociology. The summer of 2006, she was selected to participate in the U.S.-Mexico Minority Health International Research Training (MHIRT) program sponsored by the National Institute of Health. She worked as a research graduate trainee in two research projects in Ciudad Juarez with researchers from the College of Health Science at the University of Texas at El Paso and the Medical Faculty at the University of Ciudad Juarez. She was selected again the following summer to continue with the MHIRT program and worked with professors at the University of Chihuahua in Chihuahua City for three months and participated in three research projects including the project containing the dataset used for her thesis. Cynthia has worked as a Teacher Assistant in the Department of Anthropology and Sociology at the University of Texas at El Paso for two years. She plans to graduate from the University of Texas at El Paso with a Master of Arts in Sociology degree in 2008.

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