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Assessing Patterns in Sexually Transmitted Disease from Hospital Discharges in Chile: 2001-2010

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By
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ABSTRACT

Background: Sexually transmitted diseases (STDs) and HIV are still a significant public health burden globally. According to the World Health Organization (WHO), globally there are more than 1 million cases of sexually transmitted diseases and HIV infections acquired on a daily basis. In 2016, there was an estimated 97,000 new HIV infections that occurred in Latin America. There is little to no information regarding the trends over time of sexually transmitted diseases and HIV infections in multiple Latin American countries, especially Chile which is considered a developing country.
Objective: The purpose of this study is to determine the patterns of sexually transmitted diseases and HIV using hospital discharges from 2001 to 2010 across all regions of Chile. We seek to 1) assess the pattern in hospital discharges due to STDs across all regions, 2) examine the association between the outcome (STDs) and predictor variables (age, gender, region) separately 3) examine the association between the outcome (STDs) and predictor variables (age, gender, region) controlling for region.
Methods: Data for this study was derived from the Chilean Department of Health Statistics and Information (DEIS). Using SAS Software (SAS 9.4, Cary NC), descriptive analyses were performed to determine the frequency distribution of the demographic data. Bivariate and multivariate logistic regression analysis were performed to examine the association between the outcome (STDs) and the predictor variables (Age, Gender and Region).
Results: The number of females with STDs were 50883 (79%) and males 13836 (22%). 54% of the STD cases arose from patients aged between 25-44 years, followed by patients aged 45-64 years which accounted for 22% of the STD cases. The region with the highest number of STD cases is Santiago accounting for 39% of the total number of cases. Pelvic inflammatory disease (PID), which only affects women, accounted for 66% (43085) of the STD cases among females. When compared to other STDs, the prevalence of PID occurred more in females than in males. For HIV, the results revealed that the odds of female patients being diagnosed with HIV were (AOR 0.02, 95% CI:0.02-0.09) when compared to male patients. For chlamydia, the odds of a female patient being diagnosed was (AOR 1.03 95% CI 0.85-1.25) when compared to male patients. The adjusted odds of females having syphilis is 0.31, (95% CI: 0.28-0.34) times less than the odds of males having syphilis. Therefore, there was no statistically significant difference between males and females for the outcomes of HIV, chlamydia and syphilis.
Conclusion: This study shows us an overall decrease in STD diagnoses from private hospital discharges. In the year 2002, there was a slight increase, and then it decreased and plateaued until 2010. Patients aged 25-44 years had the highest cases of all STDs followed by patients aged 5-24 year which is consistent with major studies. There was no statistically significant association between STDs and gender; females had a reduced odds of being diagnosed with HIV, Syphilis, Herpes and Other STDs when compared to males. Among female patients, PID cases were the highest for all STDs.

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By

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Approval Page

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Oluwadamilola Ode-Martins
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Author's Statement

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List of Abbreviations

HIV: *Human immunodeficiency virus*
STD/STI: *Sexually transmitted disease/infection*
MSM: *Men who have sex with men*
HPV: *Human papillomavirus*
PID: *Pelvic inflammatory disease*
WHO: *World health organization*
CDC: *Centers for disease control and prevention*

CHAPTER I
Introduction

1.1 Background

Sexually transmitted diseases (STDs) and HIV are still a major public health burden globally. According to the World Health Organization (WHO), globally there are more than 1 million sexually transmitted diseases and HIV infections acquired on a daily basis (CDC, 2016). In 1999, WHO estimated 340 million new cases of curable sexually transmitted diseases globally; 79 million in Africa,191 million in Asia,14 million in North America and 38 million new cases in Latin America and the Caribbean (WHO HIV/AID, 2001). In a 2015 report, there was an estimate of 2 million HIV infections that occurred in Latin America, based on data from the Joint United Nations Program on HIV/AIDs (UNAIDS) (PAHO/WHO, 2017).

Generally, across most high-income countries, the rates of sexually transmitted diseases have declined dramatically, due to changes in socioeconomic status, risk behaviors, implementation of prevention methods among others (Elliott et al., 2002). The morbidity and mortality of sexually transmitted diseases and HIV infections are still high in low and middle-income countries, which is partly due to lack of diagnostic tests, lack of testing centers, limited surveillance systems and inadequate sexual education. According to Gerbase et al. (1999), Latin America and the Caribbean have a high prevalence of sexually transmitted disease. Latin America is the third most affected region of HIV and STDs after Africa and Asia. The pattern of STDs has been altered due to the change in social behavior, so information on the prevalence and incidence of STDs is important to monitor and manage an epidemic. In addition to causing acute morbidity, the other outcomes of sexually transmitted diseases include cervical cancer, male and female infertility, congenital syphilis, low birth weight and ectopic pregnancies among others (WHO/UNAIDS., 1999). Delays in diagnosis and treatment of STDs cause these acute complications and irreparable sequelae, and the recipients of these complications are usually women and children (Gerbase, Toscano, Silvia Titan, González-Salvatierra, & Zacarías, 1999).

There is little to no information regarding the temporal variations of sexually transmitted diseases and HIV infections in multiple Latin American countries, especially Chile which is considered a developing country. Data on STDs in Latin America and the Caribbean are limited due to the passive STD surveillance systems; the estimates of STDs reported depend on patient-seeking behaviors, quality of reporting and intensity of diagnosis (Gerbase et al., 1999). Due to the asymptomatic mechanism of some STDs, only a small number of symptomatic patients seek health care (Gerbase et al., 1999). In cases where symptoms occur, social stigma is associated with these diseases and this may lead to affected individuals seeking treatment outside of established healthcare systems or not seeking treatment at all (CDC, 2008). For some that seek treatment, the private health sectors are used rather than public health sectors to avoid stigmatization and judgement. (CDC, 2008).

Over the last decades, the health indicators for Chile have been favorable; life expectancy for men and women has increased to eighty and seventy-three years respectively (Missoni & Solimano, 2010). According to the 2007 health summary statistic from Pan American Health Organization (PAHO), the birth rate for Chile was estimated at 15.5 birth per 1000 population, infant mortality rate was 7.8 per 1000 live births and between 2000-2003, maternal mortality reduced from 1.9 per 10,000 live births to 1.4 (PAHO, 2007). The reason for this improvement according to Missoni and Solimano is a result of the socio-economic development and persistent effort in promoting preventive care (Missoni & Solimano, 2010). Though Chile health profile

has shown improvement, sexually transmitted diseases have not been given top priority in the health-care system.

According to recent Chilean news reports, there has been an increase in HIV infections in the past five years, but there is limited information analyzing the trend of the most common sexually transmitted diseases in previous years. Information on the prevalence, incidence, and mortality of diseases are gotten either from surveillance reports and epidemiological studies (Gerbase et al., 1999). For this project, I will be collecting data from hospital discharges due to STDs as a form of surveillance reporting. According to the CDC, the list of the common STDs includes Bacterial Vaginosis, Chlamydia, Gonorrhea, Hepatitis, Herpes, HIV/AIDS, Human Papillomavirus Infection (HPV), Pelvic Inflammatory Disease (PID), Syphilis, Trichomoniasis, and other STDs such as Chancroid and Lymphogranuloma Venereum (LGV) (CDC, 2016).

1.2 Purpose of Study

The purpose of this study is to observe the patterns of sexually transmitted diseases and HIV using hospital discharges from 2001 to 2010 across all regions of Chile.

A. To determine the patterns in hospital discharges due to STDs across all regions,
B. To examine the association between the STDs, gender and age through bivariate analyses
C. To examine the association between STDs, gender, age and region through a multivariate analysis.

Assessing and analyzing the patterns in STDs and HIV provides us with essential information about the prevalence and sexual behavior which could aid in better surveillance reporting and better intervention measures to decrease the incidence of STDs and HIV.

CHAPTER II
LITERATURE REVIEW

2.1 Summary of HIV and STDs in Latin America and Caribbean Countries

The cases of sexually transmitted disease vary across age, gender and regions of a country. Urban regions with a high population density are associated with a higher prevalence of sexually transmitted diseases, and the incidence rates of STDs are usually higher in youths and young adults between the ages of 15-49 years old. According to the 2015 data from the Joint United Nations Program on HIV/AIDS (UNAIDS), among the 2 million people infected with HIV in Latin America and the Caribbean, more than 98% were aged 15 and above (PAHO/WHO, 2017). The prevalence of HIV infection ranges from 0.4 to 0.6% and has continued to be constant over the past 10 years. "The epidemic mainly affects men, represent 68% of the people with HIV" (PAHO/WHO, 2017). For curable sexually transmitted diseases, there are an estimated 64 million new cases annually among people aged 15 to 49 years. The key populations that are usually affected by sexually transmitted diseases are sex workers, men who have sex with men (MSM), and transgender women.

2.2 Patterns of HIV and STDs in Other Countries

In this review of the literature, we will be reporting on the patterns of STD cases from hospital discharges in different countries. For the purpose of this literature, terms such as "diseases" and "infection" are used interchangeably. An article by Grover and Rajagopal (2009), focuses on the trend of STIs in a Bangalore tertiary care hospital over a 33-year period. The retrospective study analyzed the records of male soldiers who were diagnosed with a sexually transmitted disease from January 1974 to December 2006. The results revealed the most common STI to be chancroid which had 1684 (37.2%) cases out of 4532 observations. Syphilis was next with 737 cases (16.3%) followed by lymphogranuloma venereum (LGV) with 632 (13.9%) cases. The most common age group which supports other literature was between 21-30 years (Grover & Rajagopal, 2009). The results of the trend showed an overall decline in STD cases, especially for major STDs.

In an article by Chen et al. (2000), the time trend of sexually transmitted diseases in China was analyzed from 1989 to 1998 using a chi-squared test and a nonlinear regression model. The results of that study revealed that STD incidence increased drastically in both men and women. There was a nonlinear growth trend for all STDs except gonorrhea, and the incidence increased in females 4.20 times than that in males.

In another retrospective study by Gullette et al. (2009), the factors associated with sexually transmitted diseases were analyzed using logistic regression, multiple linear regression, and a chi-squared test. This study was seeking to answer the various question using the three different analysis; the logistic regression was applied for cases where the outcome was dichotomous, multiple linear regression was applied where the dependent variable was continuous, and the chi-squared test was applied to test for homogeneity.

Two of the research questions were to determine the risk factors that were associated with STIs in a community in Arkansas and also obtain the frequency and type of STIs that were reported for individuals seeking treatment in the STI clinics. The data was collected from 237 medical records in STI clinic in Arkansas. The results from the regression revealed that majority of the individuals had STIs that were nonulcerative (Gonorrhea, chlamydia and or trichomonas), the majority of the population were men (n=119) and African American (73.2%). For the

predictor variable analysis, it was reported that more men used more condoms than women and among those who had an STI, more men reported having more sexual partners than women (Gullette et al., 2009). The chi-squared analysis was performed to observe if men and women who have STIs have new or more sexual partners than those who do not and the results revealed that the men reported having more sexual partners than women, but there were no significant differences between men and women who had prior sexual infections.

Generally, the themes of these articles reveal that men had a higher incidence of some STDs and HIV than women which is consistent with other research and the most common age group distribution with the highest STD and HIV cases are observed in people aged 21 years and above. All these highlighted studies display the prevalence of STDs and HIV and the key population most affected by it. These results could be important informing policy changes to better protect the key populations at risk through education on preventive care, provision of better healthcare options, establishment of well-equipped testing centers or clinics and establishment of adequate surveillance systems.

CHAPTER III
METHODS

3.1 Data Collection and Data Sources

For this study, secondary analyses were run using data derived from the Chilean Department of Health Statistics and Information (DEIS, 2018). This is the national database that collects information regarding hospital records from public and private health sectors. Demographic information and daily discharges due to sexually transmitted diseases were obtained from the private health sector records from 2001 to 2010. The demographic data collected included age, gender, ethnicity. Hospital data included the length of stay in the hospital, ICD-10 code diagnosis, date of patient hospital discharge, and the region of residence for the patients. Infections with any common STD was defined according to the International Classification of Disease (ICD-10). The descriptive list of the STDs chosen for this study is listed in Table 1.

3.2 Statistical Analysis

Between 2001 to 2010, a total of 64,719 patients from private hospitals records were diagnosed with an STD, the baseline number of patients from the hospital records from 2001 to 2010 was 15,983,971, female patients accounted for 61% while male patients accounted for 39%. Eighteen patients were excluded due to missing values. SAS Software (SAS 9.4, Cary NC) was used to clean, recode variables and perform statistical analyses. Descriptive analyses were performed to observe the frequency distribution of the demographic data. New variables were created to sum the number patients discharged due to each sexually transmitted disease. The region of residence was re-coded from numeric to character variables. An alpha level of 0.05 was set as a level of significance for all analyses. The variables analyzed in the study were the region of residence for the patients, gender, age, date of patient hospital discharge and length of stay in the hospital.

A bivariate logistic regression analysis was performed to produce crude odds ratio to examine the association between the (outcome and predictor variables) STDs and gender, STDs and age and STDs and region which produce odds ratios (OR) and its 95% confidence interval (CIs). The multivariate analyses performed to determine the relationship between the outcome variable (STDs) and predictor variable (age, gender and region), controlling for region. We wanted to examine if age, gender and region were predictive of the outcome (sexually transmitted diseases).

Table 1: List of Sexually Transmitted Diseases and ICD-10 code

Sexually Transmitted Disease	***ICD-10 Code***
Chlamydia	A56
Gonorrhea	A54
Syphilis	A50-A53
HIV	B20-B24
Genital Herpes	A60, B00
Viral Hepatitis B	B16, B18, B18.1
Viral Hepatitis C	B17.1, B18.2
Other STDs (*lymphogranuloma venereum, chancroid, granuloma inguinale, trichomoniasis, anogenital warts, other predominantly sexually transmitted disease not elsewhere classified*)	A57-A59, A63, A64
Pelvic Inflammatory Disease	N70-N76

CHAPTER IV
RESULTS

4.1 Descriptive Statistics

The descriptive analyses were reported as frequency and percentage in Table 2. A total number of 64719 patients were discharged from private hospitals due to a sexually transmitted disease. Of those, 64719 patients with STD cases, 79% (50833) were females and 22% (13836) were males. 54% of the STD cases arose from patients aged between 25-44 years, followed by patients aged 45-64 years which accounted for 22% of the STD cases. The region with the highest number of STD cases is Santiago accounting for 39% of the case. Pelvic inflammatory disease (PID), which only affects women, accounted for 85% (43085) of the STD cases among females. In 2002, there was an increase in the number of STD diagnoses compared to other years. PID, HIV, herpes and other STDs accounted for the majority of STD cases. Except for chlamydia, gonorrhea, and herpes, males had a higher number of STD cases. For Syphilis, males accounted for 58% of the cases. Males accounted for 84%, 58% and 72% of cases for HIV, Other STD, and Viral Hepatitis B respectively.

4.2 Logistic Regression

The bivariate and multivariate logistic regression analyses were reported as unadjusted odds ratio and adjusted odds ratio respectively, and 95% confidence interval (CI) in Table 4 and 5. The bivariate analyses was performed to determine the associations between the outcome variable (STDs) and the predictor variable (gender and age) separately. The multivariate analyses performed to determine the relationship between the outcome variable (STDs) and predictor variable (age, gender and region), controlling for region. Males were chosen as the reference group for the analyses, denoted as REF in Table 4. For HIV outcomes, the results revealed that the odds of female patients being diagnosed with HIV were (AOR 0.02, 95% CI:0.021-0.024) when compared to male patients, adjusting for age and region. For the outcome of chlamydia, the odds of a female patient being diagnosed was (AOR 1.03, 95% CI 0.85, 1.25) when compared to male patients. For syphilis, the odds of a female patient being diagnosed with syphilis was (AOR 0.31, 95% CI: 0.28-0.34). The odds of being diagnosed with herpes was lower for female patients (AOR 0.36, 95% CI: 0.34-0.39) compared to males, however the results were not statistically significant. The second analyses were the association between all STDs and age groups.

The age group with the highest number of STD cases were 25-44-year olds 53.7% (34725). For HIV outcomes, the adjusted odds of 25-44-year-old patients being diagnosed with HIV was 11.93 times the odds of patients under 5 being diagnosed with HIV. For chlamydia, the adjusted odds of patients aged ≥ 65 years being diagnosed with chlamydia was 7.15 times the odds of patients under 5 having chlamydia. Patients aged ≥ 65 years had an increased odds (AOR 288.12) of being diagnosed with viral hepatitis c when compared to patients under 5. For PID, which affects only women, 25-44-year-old patients had an increased odds (AOR 579.7) of being diagnosed with PID when compared to patients under 5. The results from the association between all STDs and age category were statistically significant.

Table 2: Pattern of STDs from Hospital Discharges (N=64719).

Sexually Transmitted Disease	Frequency (N)	Percentage (%)
Chlamydia	622	0.96
Gonorrhea	386	0.60
Herpes	4133	6.39
HIV	7659	11.83
Other STD	3742	5.78
PID	43085	66.57
Syphilis	2564	3.96
Viral Hepatitis B	1621	2.50
Viral Hepatitis C	907	1.40
Total STDs	64719	100.00

PID: Pelvic Inflammatory disease, Other STD: lymphogranuloma venereum, chancroid, granuloma inguinale, trichomoniasis, anogenital warts, other predominantly sexually transmitted disease not elsewhere classified

Table 3: Descriptive Statistics of Hospital Discharge Data, 2001-2010.

Variable		**Frequency** *N* **(%)**
Gender	Female	50883 (78.62)
	Male	13836 (21.38)
	Total	64719 (100)
Age	< 5 years	3428 (5.30)
	5-24 years	10268 (15.87)
	25-44 years	34725 (53.66)
	45-64 years	13648 (21.09)
	≥ 65 years	2650 (4.09)
Region	De Aisen del Gral .C. Ibanez del Campo	452 (0.70)
	De Antofagasta	3015 (4.66)
	De Arica y Parinacota	287 (0.44)
	De Atacama	1242 (1.92)
	De Coquimbo	2100 (3.25)
	De La Araucania	3698 (5.72)
	De Los Lagos	4916 (7.60)
	De Los Rios	510 (0.79)
	De Magallanes y de La Antartica Chilena	1001 (1.55)
	De Tarapaca	2251 (3.48)
	De Valparaiso	7249 (11.20)
	De Biobio	6345 (9.81)
	Del Libertador B. OHiggins	2430 (3.76)
	Del Maule	3761 (5.81)
	Metroplitana de Santiago	25444 (39.33)
Year	2001	6523 (10.08)
	2002	7051 (10.89)
	2003	6568 (10.15)
	2004	6317 (9.76)
	2005	6542 (10.11)
	2006	6346 (9.81)
	2007	6304 (9.74)
	2008	6651 (10.28)
	2009	6544 (10.11)
	2010	5873 (9.07)

Table 4: Bivariate Logistic Regression of Outcome Variables by Gender and Age using Hospital Discharge Data. N= 64719

Predictor Variable		**Outcome Variable**									
		Chlamydia OR (95% CI)	P-value	**Gonorrhea** OR (95% CI)	P-value	**Herpes** OR (95% CI)	P-value	**HIV** OR (95% CI)	P-value	**OtherSTD** OR (95% CI)	P-value
Gender											
	Female	1.03 (0.85-1.25)	0.7781	0.51 (0.41-0.63)	<0.0001	0.40 (0.38-0.43)	<0.0001	0.02 (0.02-0.09)	<0.0001	0.16 (0.14-0.17)	<0.0001
	Male	REF	--	--	--	--	--	--	--	--	--
Age											
	< 5 years	REF	--	--	--	--	--	--	--	--	--
	5-24 years	0.62 (0.42-0.92)	<0.0001	0.88 (0.61-1.27)	0.0286	0.25 (0.22-0.27)	<0.0001	2.62 (2.19-3.12)	**<0.0001**	5.40 (4.53-6.51)	**<0.0001**
	25-44 years	0.33 (0.23-0.48)	<0.0001	0.42 (0.29-0.59)	<0.0001	0.03 (0.03-0.04)	<0.0001	13.45 (11.53-15.73)	**<0.0001**	2.05 (1.72-2.44)	**0.0003**
	45-64 years	0.73 (0.51-1.06)	<0.0001	0.36 (0.24-0.53)	<0.0001	0.08 (0.07-0.09)	<0.0001	8.12 (6.95-9.60)	**<0.0001**	2.05 (1.69-2.47)	**0.0036**
	≥ 65 years	9.42 (6.68-13.29)	**<0.0001**	1.39 (0.90-2.14)	<0.0001	0.48 (0.42-0.55)	<0.0001	2.69 (2.15-3.36)	**<0.0001**	2.87 (2.28-3.59)	**0.0010**

*OR= odds ratio; CI= confidence interval. **Bold** indicates statistically significant at p-value <0.05.

Table 4 Cont'd: Bivariate Logistic Regression of Outcome Variables by Gender and Age using Hospital Discharge Data.

Predictor Variable		**Outcome Variable**									
		PID		**Syphilis**		**Viral HepB**		**Viral HepC**		**All STDs**	
		OR (95% CI)	P-value	OR (95% CI)	P-value	OR (95% CI)	P-value	OR (95% CI)	P-value	OR (95% CI)	P-value
Gender											
	Female	>999.99 (<0.001->999.99)	0.7987	0.30 (0.27-0.33)	<0.0001	0.09 (0.08-0.10)	<0.0001	0.29 (0.26-0.34)	<0.0001	0.11 (0.11-0.12)	<0.0001
	Male	REF	--	--	--	--	--	--	--	--	--
Age											
	< 5 years	REF	--	--	--	--	--	--	--	--	--
	5-24 years	176.59 (127.95-243.72)	**<0.0001**	0.02 (0.02-0.03)	<0.0001	8.29 (6.03-11.39)	**<0.0001**	12.37 (1.68-91.23)	**<0.0001**	1.81 (1.67-1.97)	**<0.0001**
	25-44 years	521.69 (378.62-718.84)	**<0.0001**	0.02 (0.01-0.02)	<0.0001	3.15 (2.30-4.31)	0.0770	16.61 (2.32-118.80)	**0.0025**	1.41 (1.31-1.51)	**<0.0001**
	45-64 years	264.90 (191.95-365.89)	**<0.0001**	0.03 (0.03-0.04)	<0.0001	4.75 (3.45-6.54)	**<0.0001**	243.65 (34.30->999.99)	**0.0263**	1.18 (1.09-1.23)	**<0.0001**
	≥ 65 years	52.62 (37.85-73.16)	**<0.0001**	0.07 (0.06-0.08)	0.0724	4.01 (2.73-5.90)	0.1550	285.63 (39.99->999.99)	**<0.0001**	3.91 (3.53-4.33)	**<0.0001**

*OR= odds ratio; CI= confidence interval. **Bold** indicates statistically significant at p-value <0.05.

Table 5: Multivariate Logistic Regression of Outcome Variables by Gender, Age and Region.

Predictor Variable		**Outcome Variable**									
		Chlamydia AOR (95% CI)	P-value	**Gonorrhea** AOR (95% CI)	P-value	**Herpes** AOR (95% CI)	P-value	**HIV** AOR (95% CI)	P-value	**OtherSTD** AOR (95% CI)	P-value
Gender											
	Female	1.07 (0.9-1.3)	0.5325	0.48 (0.38-0.59)	<0.0001	0.36 (0.34-0.39)	<0.0001	0.02 (0.02-0.024)	<0.0001	0.15 (0.14-0.16)	<0.0001
	Male	REF	--	--	--	--	--	--	--	--	--
Age											
	< 5 years	REF	--	--	--	--	--	--	--	--	--
	5-24 years	0.63 (0.42-0.93)	<0.0001	0.87 (0.60-1.26)	0.0464	0.24 (0.22-0.26)	<0.0001	2.61 (2.17-3.12)	**<0.0001**	5.34 (4.45-6.40)	**<0.0001**
	25-44 years	0.35 (0.24-0.51)	<0.0001	0.44 (0.31-0.63)	<0.0001	0.04 (0.03-0.04)	<0.0001	11.93 (10.19-13.98)	**<0.0001**	2.11 (1.77-2.53)	**0.0088**
	45-64 years	0.75 (0.51-1.08)	0.0003	0.37 (0.25-0.57)	<0.0001	0.08 (0.07-0.09)	<0.0001	6.99 (5.93-8.25)	**<0.0001**	2.10 (1.74-2.53)	**0.0036**
	≥ 65 years	7.15 (5.03-10.15)	**<0.0001**	1.28 (0.82-1.99)	<0.0001	0.43 (0.38-0.49)	<0.0001	2.65 (2.10-3.33)	**<0.0001**	2.75 (2.19-3.47)	**0.0232**
Region	Santiago	REF	--	--	--	--	--	--	--	--	--
	De Atamaca	2.34 (1.42-3.81)	0.8737	2.25 (1.26-4.00)	0.1250	1.25(0.96-1.64)	0.0733	0.11 (0.06-0.18)	0.0019	1.12 (0.84-1.49)	0.2014
	De Arica y Parinacota	0.93 (0.23-3.81)	0.9191	1.47 (0.36-5.97)	0.9935	0.67 (0.33-1.39)	0.0132	0.60 (0.38-0.94)	<0.0001	1.75 (1.12-2.72)	0.1991

*OR= odds ratio; CI= confidence interval. **Bold** indicates statistically significant at p-value <0.05.

Table 5 Cont'd: Multivariate Logistic Regression of Outcome Variables by Gender, Age and Region.

Predictor Variable		**Outcome Variable**									
		PID		**Syphilis**		**Viral HepB**		**Viral HepC**		**All STDs**	
		AOR (95% CI)	P-value	AOR (95% CI)	P-value	AOR (95% CI)	P-value	AOR (95% CI)	P-value	AOR (95% CI)	P-value
Gender											
	Female	>999.99 (<0.001->999.99)	0.7988	0.31 (0.28-0.34)	<0.0001	0.08 (0.07-0.10)	<0.0001	0.37 (0.33-0.43)	<0.0001	0.12 (0.11-0.12)	<0.0001
	Male	REF	--	--	--	--	--	--	--	--	--
Age											
	< 5 years	REF	--	--	--	--	--	--	--	--	--
	5-24 years	189.4 (137.1-261.6)	**<0.0001**	0.02 (0.02-0.03)	<0.0001	8.27 (6.01-11.39)	**<0.0001**	11.46 (1.55-84.66)	**0.0038**	1.81 (1.67-1.96)	**<0.0001**
	25-44 years	579.7 (420.2-799.5)	**<0.0001**	0.01 (0.01-0.02)	<0.0001	3.28 (2.39-4.51)	0.1682	13.04 (1.82-93.52)	**0.0048**	1.41 (1.31-1.52)	**<0.0001**
	45-64 years	299.8 (216.9-414.2)	**<0.0001**	0.03 (0.02-0.04)	<0.0001	4.93 (3.57-6.81)	**<0.0001**	192.39 (27.03->999.99)	**<.0001**	1.18 (1.09-1.28)	**<0.0001**
	≥ 65 years	63.2 (45.4-88.0)	**0.0037**	0.07 (0.05-0.08)	0.1462	4.13 (2.81-6.10)	0.1364	288.12 (40.24->999.99)	**<0.0001**	3.69 (3.33-4.09)	**<0.0001**

*OR= odds ratio; CI= confidence interval. **Bold** indicates statistically significant at p-value <0.05.

Table 5 Cont'd: Multivariate Logistic Regression of All STDs by Region

Predictor Variable		**Outcome Variable**	
		All STDs	
		AOR (95% CI)	P-value
Region	De Santiago	REF	--
	De Aisén	0.94 (0.77-1.16)	0.4622
	De Antofagasta	0.78 (0.72- 0.85)	<.0001
	De Arica	0.87 (0.67- 1.11)	0.1912
	De Atacama	0.79 (0.69- 0.89)	<.0001
	De Coquimbo	0.87 (0.79-0.97)	0.0029
	De La Araucanía	1.26 (1.17- 1.35)	**<.0001**
	De Los Lagos	1.04 (0.97- 1.11)	0.4268
	De Los Ríos	1.02 (0.84- 1.24)	0.9073
	De Magallanes	0.94 (0.82- 1.07)	0.2301
	De Tarapacá	1.92 (1.75- 2.09)	**<.0001**
	De Valparaíso	1.19 (1.13- 1.26)	**<.0001**
	Del Bíobío	0.96 (0.90- 1.02)	0.0692
	Del B. OHiggins	0.98 (0.89- 1.07)	0.4880
	Del Maule	0.99 (0.92- 1.07)	0.7165

*OR= odds ratio; CI= confidence interval. **Bold** indicates statistically significant at p-value <0.05.

Table 6: STD Hospital Discharge Cases by year **(N= 64719).**

Factors		Year of Discharge									
		2001	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
STD N (%)											
	Chlamydia	38 (0.58)	36 (0.51)	45 (0.69)	70 (1.11)	68 (1.04)	73 (1.15)	38 (0.60)	93 (1.40)	89 (1.36)	72 (1.23)
	Gonorrhea	51 (0.78)	49 (0.69)	43 (0.65)	39 (0.62)	36 (0.55)	35 (0.55)	37 (0.59)	24 (0.36)	32 (0.49)	40 (0.68)
	Herpes	442 (6.78)	482 (6.84)	438 (6.67)	384 (6.08)	411 (6.28)	420 (6.62)	412 (6.54)	401 (6.03)	402 (6.14)	341 (5.81)
	HIV	693 (10.62)	896 (12.71)	811 (12.35)	547 (8.66)	696 (10.64)	738 (11.63)	773 (12.26)	865 (13.01)	806 (12.32)	834 (14.20)
	Other STD	370 (5.67)	361 (5.12)	362 (5.51)	351 (5.56)	334 (5.11)	338 (5.33)	336 (5.33)	387 (5.82)	424 (6.48)	479 (8.16)
	PID	4378 (67.12)	4564 (64.73)	4348 (66.20)	4431 (70.14)	4513 (68.99)	4278 (67.41)	4226 (67.04)	4411 (66.32)	4287 (65.51)	3649 (62.13)
	Syphilis	281 (4.31)	263 (3.73)	272 (4.14)	283 (4.48)	224 (3.42)	256 (4.03)	261 (4.14)	228 (3.43)	257 (3.93)	239 (4.07)
	Viral Hepatitis B	165 (2.53)	218 (3.09)	182 (2.77)	146 (2.31)	160 (2.45)	157 (2.47)	146 (2.32)	137 (2.06)	151 (2.31)	159 (2.71)
	Viral Hepatitis C	105 (1.61)	182 (2.58)	67 (1.02)	66 (1.04)	100 (1.53)	51 (0.80)	75 (1.19)	105 (1.58)	96 (1.47)	60 (1.02)
	Total	6523 (10.08)	7051 (10.89)	6568 (10.15)	6317 (9.76)	6542 (10.11)	6346 (9.81)	6304 (9.74)	6651 (10.28)	6544 (10.11)	5873 (9.07)

Figure 1: Number of STD Cases from Hospital Discharge Data by year (2001-2010).

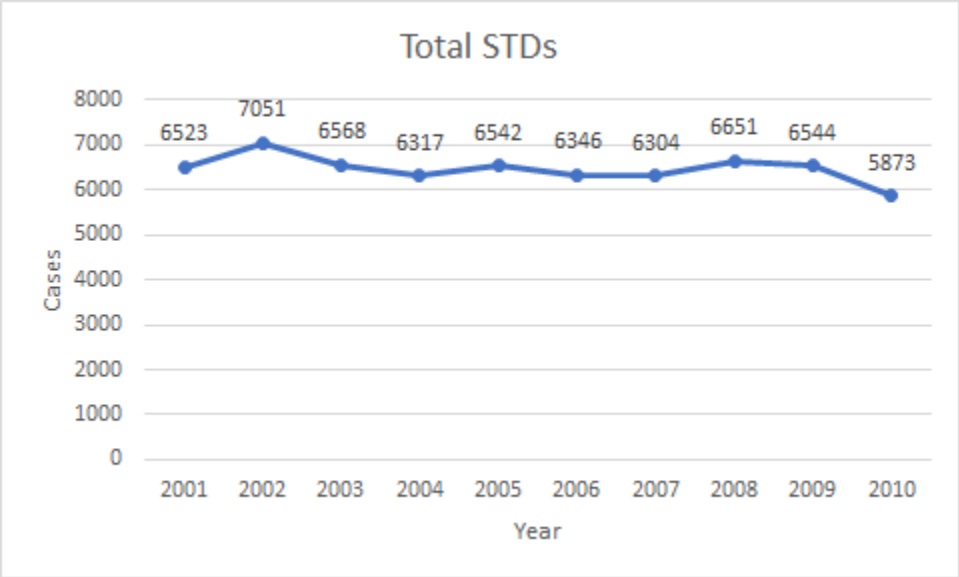


Figure 2: Graph of Major STD Cases from Hospital Discharge Data by year (2001-2010).

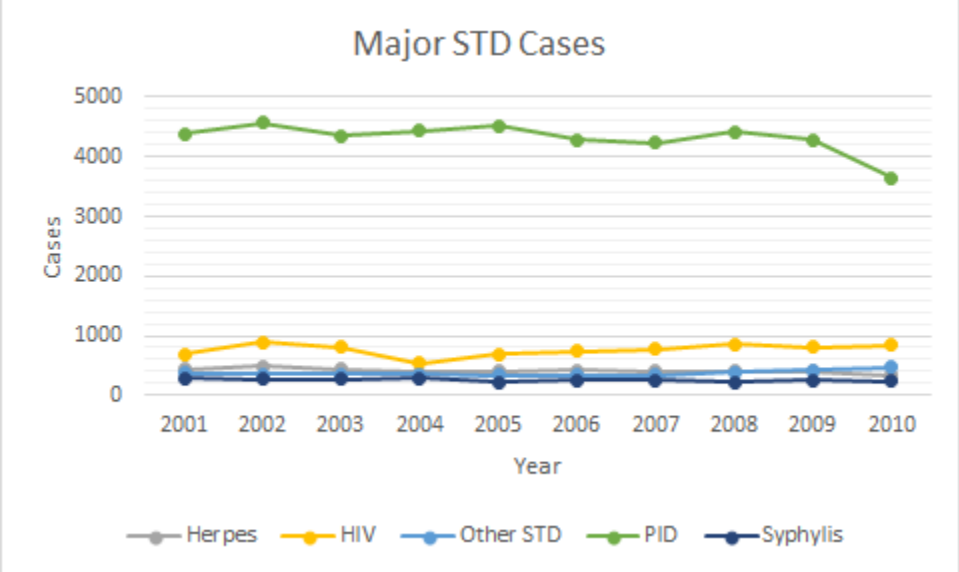
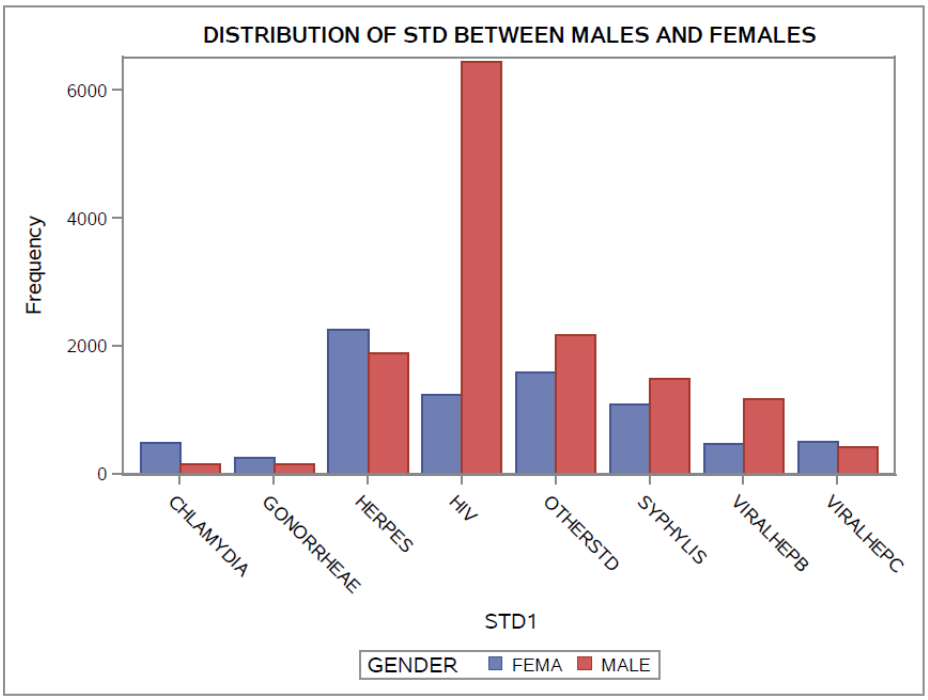


Figure 3: Frequency distribution of STDs by Gender



CHAPTER V
DISCUSSION AND CONCLUSION

Pelvic Inflammatory Disease (PID) was found to be the most common sexually transmitted disease among women based on the hospital discharge data. The diagnosis of PID accounted for 43,085 (66.57%) of the STDs that were reported by private hospitals from 2001-2010. PID is an infection of the upper reproductive tract of a female (Das, Ronda, & Trent, 2016). *Neisseria gonorrhoeae* and *Chlamydia trachomatis* among others are usually associated in the cases of PID (Das et al., 2016). PID mainly affects women of fertile ages between 15 and 49 years (De la Torre, 1980). According to Das et al., an article estimated that one in five PID cases develop in women younger than 19 years (Das et al., 2016). In another study, when compared to other younger age groups, adolescents and young women who were aged between 17-21 years were twice as likely to be diagnosed with PID (Goyal et al., 2013). The results of this study revealed that PID diagnosis among 25-44 years old women was the highest when compared to other age groups. Females aged 25-44 years were 579.7 (95% CI, 420.2-799.5) times more likely to be diagnosed with PID when compared to females under 5 years. The results from this study are consistent with the results from other studies regarding the population affected. Females aged 5-24 years had an adjusted odds of 189 (95% CI, 137.1-261.6) when compared to females under 5 years. Patients under five were chosen as the reference group as they are usually not sexually active and have a lower risk of getting an STD.

The second most common diagnosis of STDs was HIV which accounted for 11.83%. Based on the results of this study, we observed that males were associated with an increased odds of being diagnosed with HIV when compared to females (0.02 95% CI: 0.02-0.09 p-value = <0.0001). Females have a 50 lower odds of being diagnosed with HIV when compared to males. Studies have shown that the vital population affected by HIV in Latin America countries include: men who have sex with men (MSM), female sex workers and intravenous drug users (IDU) (Miller, Buckingham, Sanchez-Dominguez, Morales-Miranda, & Paz-Bailey, 2013). Though information about the patient's sexual orientation was not included in the dataset, our results are however consistent with other studies regarding the vital population most affected by HIV. Generally, the HIV epidemic in Latin America has an estimated population prevalence of 0.5% (95% CI: 0.4-0.6) (Miller et al., 2013). The age group most affected by HIV diagnosis were 25-44 years old, accounting for 66% (5050) of all HIV diagnosis. Patients who were aged 25-44 years were 11.93 (95% CI: 10.19-13.98) times more likely to be diagnosed when compared to the reference group. Majority of the diagnosis were from Santiago, the capital of Chile.

The third most common STD according to the hospital discharges was Genital herpes. There are two viruses that could cause genital herpes; herpes simplex virus type 1(HSV-1) or type 2 (HSV-2). Majority of the cases around the world are caused by HSV-2 (Looker, Garnett, & Schmid, 2008). For this study, we observed that the adjusted odds of being diagnosed with herpes among patients aged 65 and older when compared to the reference group (patients aged 5 and below), was 0.43 (95% CI: 0.38-0.49). Patients aged < 5 years accounted for majority of the diagnosis (33%) followed by patients aged 5-24 years accounting for (28%) of the diagnosis. A possible reason for the high number of cases among young children is the transmission of the virus from mother to child during birth (Looker et al., 2008). Global estimates of herpes estimate that more women were infected with herpes than men and in Latin America, there was a higher incidence of herpes among 15-19-year-old women (Looker et al., 2008).

Other STDs which includes lymphogranuloma venereum, chancroid, granuloma inguinale, trichomoniasis, anogenital warts, other predominantly sexually transmitted disease not elsewhere classified accounted for 6% of the total STD cases. 25-44-year-old patients had the highest number of cases among all age groups and accounted for 43%, followed by patients aged 5-24 years, accounting for 30%.

The odds of being diagnosed with chlamydia in females was 1.03 times more than being diagnosed in males. Females are at a higher risk of having complications due to untreated chlamydia.

The hospital cases for syphilis accounted for 4% of the total STDs. The adjusted odds of females being diagnosed with syphilis was 0.30 (95% CI: 0.28-0.34). An interesting observation was that patients less than five years old accounted for 63% (1577) among all age groups. Patients who were aged between 25-44 years had decreased odds of being diagnosed with syphilis 0.01 (95% CI: 0.01-0.02) compared to patients less than 5 years. The cause of the high number of syphilis among this age group could be due to congenital syphilis. The prevalence of congenital syphilis has been increasing globally, in part this is due to inadequate antenatal care services and subpar STD control programs (Saloojee, 2004). In Latin America and Africa, it is estimated that 2 to 15% of all pregnancies occur in women with untreated syphilis (CDC, 2008). Women who are infected with syphilis are 12 times more likely to have adverse pregnancy outcomes than women without syphilis. Among infants exposed to syphilis, it is estimated that about 25-75% will have congenital syphilis (Phiske, 2014).

The incidence of STDs varies by geographic location. Santiago was the region that had the highest number of STD cases accounting for 39.3%. Santiago is the capital and the largest city in Chile, which contributes to the high frequency of STD cases; there was an increase in population in 2002 and then continued to grow slowly over the next years ("Santiago Population 2018 (Demographics, Maps, Graphs)," 2018). Due to the change in socioeconomic and cultural environment, there has been an increase in the migration of people from rural areas to urban areas which have had an impact in the increase of sexually transmitted diseases and HIV prevalence in the urban areas of countries (Chen, 2000).

Limitations and Strengths

One limitation of this study was that there was limited literature on sexually transmitted diseases in Chile and other Latin American countries. Some of the literature found were written in Spanish, with no option of translating to English. Another limitation was related to the access of articles; most studies in Chile that involved sexually transmitted diseases were not available to the public. Another limitation of this study was the dataset itself; the hospital discharge dataset had no information on the income, education and sexual orientation of the patients. This information would have been beneficial in observing the key populations affected by the most common STDs. The rate of disease couldn't be included due the fact that the hospital records were from private health sectors, so it would not be representative of the general population. The last limitation is that the dataset was obtained from private hospitals rather than public hospitals, which would not give us access to a diverse demographic and socioeconomic profile of the population.

One strength from this study is that it gives us an insight on the key populations that have been affected by STDs and allows us to use hospital dataset as a form of surveillance reporting to observe the trends of STDs in a country that lacks an active surveillance system.

Implications of Findings

The implication of this study is that interventions can be set in place to prevent the potential rise of STDs in Chile. An example of an intervention can be promoting safe sex practices among young adults, building more STD testing clinics in the metropolitan areas of Chile. This will aid in the improvement of Chile's surveillance systems.

Conclusion

This study indicates an overall decrease in STDs and HIV diagnosis from private hospital discharges from year to year. In the year 2002, there was a slight increase in cases, then decrease and plateau until 2010. Patients aged 25-44 years had the highest cases of all STDs followed by patients aged 5-24 year which is consistent with major studies. Males had higher cases of HIV, syphilis, other STDs and viral hepatitis b when compared to females. PID cases were unusually high among female patients which sheds light on the health-seeking behaviors of women in Chile due to the asymptomatic nature of PID. The metropolitan area of Chile, Santiago had the highest number of cases throughout Chile. This due to the increase in migration from rural areas to urban areas. Most people move for better opportunities and urban areas often provide employment opportunities which bring an influx of young people, the population most affected by STDs. The results of this study indicate the importance of assessing patterns of STDs so as to aid in better surveillance reporting and better intervention measures to decrease the incidence of STDs.

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