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SYPHILIS AND CONGENITAL SYPHILIS AMONG WOMEN IN SAN BERNARDINO COUNTY

Valerie Alfaro

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SYPHILIS AND CONGENITAL SYPHILIS AMONG WOMEN IN SAN
BERNARDINO COUNTY

A Thesis
Presented to the
Faculty of
California State University,
San Bernardino

In Partial Fulfillment
of the Requirements for the Degree
Master of Public Health

by
Valerie Alfaro
May 2023

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May 2023

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ABSTRACT

Background: Syphilis is a sexually transmitted infection that mostly affects individuals from a lower income status. San Bernardino County has a high poverty rate and a high rate of Congenital Syphilis. Pregnant women who test positive for Syphilis run the risk of passing the infection on to the fetus. Babies born with Congenital Syphilis may experience many complications, and therefore, the treatment is more intense. The best prevention for Congenital Syphilis is regular screening during pregnancy.

Methods: This study used quantitative research based on secondary data collected from San Bernardino County, Department of Public Health. Data were gathered by an epidemiologist using the database CalREDIE and included the year when the mom and baby tested positive for Syphilis, the resolution status, and final disposition.

Results: The sample included 514 pregnant women. Data revealed an increase in Syphilis cases between 2016 and 2021. A chi-square test was used to determine that statistically significant differences in the frequencies of reported Syphilis cases between those treated. However, there was no significant difference between the groups of women who tested positive each year, as well as no significant difference between the groups of congenital Syphilis cases each year.

Conclusion: The results of this study suggest that in the past seven years, the number of positive Syphilis tests in women and babies in San Bernardino County

have increased. However, the fact that additional tests are being ordered suggests regular screening, which is the best preventative measure for Congenital Syphilis. These data can help influence the reproductive health of many women as well as the long-term health of their babies.

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CHAPTER ONE

INTRODUCTION

Problem Statement

San Bernardino County is known for being the largest county in the United States (U.S) according to land size and the fifth largest city in California according to population size. The county contains 23 cities, all of which are home to 2.1 million residents, with a projected growth rate of 16% between 2020 and 2045 (San Bernardino County, 2023). The overall poverty rate in San Bernardino County is 13%, the child poverty rate is 18%, where the median household income is \$67,903 (San Bernardino County 2023). Overall Poverty rate is considered the minimum income amount in a household in a given community and child poverty rate affects children that live in poverty level households. Poverty can negatively impact the upward mobility of an individual, which can hinder their ability to achieve their full potential and maximize their contributions to the community (San Bernardino County, 2023). Understanding the poverty rate in a County is important when determining the eligibility for health and human services and programs (San Bernardino County, 2023). The eligibility of health and human services programs includes sexual health services, such as screening, treatment, and education. Syphilis is a particularly burdensome sexually transmitted infection (STI), especially in areas with a high poverty rate. A study from Massachusetts revealed that populations living below the federal poverty level had a dramatic increase in cases and Syphilis persisted over time

(Smock, L. et al 2017). The 2019 income threshold for poverty was an individual who earns an annual income of less than \$12,490 (San Bernardino County, 2023). The percentage of poverty when it comes to a family household, including children, is 10.9% (San Bernardino County, 2023). San Bernardino County's poverty rate is higher than state and national averages and is highest among counties like Orange County, San Diego County, and Riverside County (San Bernardino County, 2023). In San Bernardino, women are more likely to live in poverty when compared to men. Where 14.5% of females were living in poverty in 2019, 12% of males were living in poverty (Overall Poverty, 2023).

Living in poverty can make it difficult to stay healthy in relation to sexually transmitted infections. It is the lack of jobs and education that can allow this to happen (CDC, 2020). When looking at health equity, issues such as accessing quality sexual health services and trusting the health care system can lead to less people seeking health care (CDC, 2020). Unfortunately, accessing sexual health can impact women differently from men, possibly making women more vulnerable to sexually transmitted infections (STIs) (CDC, 2023). It is women who bear the long-term consequences of STIs. Each year at least 20,000 women suffer from infertility due to untreated STIs (CDC, 2023). According to research, the vagina is thinner and more delicate than the skin of the penis, making it easier for bacteria to penetrate, putting women at higher risk for STIs (CDC, 2023). Research has shown that women are less likely to experience symptoms than men (CDC, 2023). If they are experiencing symptoms, they are more likely

to confuse them for something else, such as having regular discharge or yeast infections (CDC, 2023). Additionally, women who are pregnant and are left untreated can pass STIs to their babies, which can lead to harmful complications (CDC, 2023).

Being pregnant and having either genital herpes, HIV, or Syphilis can lead to passing the infection to the fetus (CDC, 2022). Syphilis is a sexually transmitted bacterial infection that can pose life threatening complications, which can be avoided with treatment. It can spread from person-to-person by having vaginal, anal, or oral sex with someone who has Syphilis (CDC, 2022). The only way to completely avoid getting Syphilis is by abstaining from any sex, otherwise, one can reduce their risk of getting Syphilis by being in a monogamous relationship with someone who has been tested and does not have syphilis or by using condoms effectively (CDC, 2022). There are 4 different stages of Syphilis: primary, secondary, latent, and tertiary. Primary and secondary Syphilis presents as an infection and often leads to obvious symptoms such as lesions/sores and rashes that are reddish-brown in color (CDC, 2022). If left untreated, latent Syphilis shows no visible signs or symptoms within the body. Latent Syphilis may last for years, it is not transmitted during this stage, but getting treatment is important to avoid complications (CDC, 2022). Finally, those that remain untreated may progress to the tertiary stage. It is in this stage where multiple organ system failure can result, which can ultimately lead to death (CDC, 2022). Throughout any of the 4 stages mentioned, Syphilis can affect the nervous

system leading to Neurosyphilis, eyesight leading to Ocular Syphilis, and hearing leading to Ootosyphilis (CDC, 2022). Being Pregnant and having Syphilis can lead to having a low-birth-weight-baby, a premature baby, or having a stillborn. A baby born with Syphilis may not show symptoms right away, but within a few weeks the baby can develop problems such as cataracts, deafness, seizure and can even die (CDC, 2022).

Syphilis treatment is the same for both pregnant and non-pregnant individuals. However, during pregnancy, the timeline for getting treatment is stricter, while non-pregnant individuals may have more leniency when getting treatment. Those who have primary and secondary Syphilis can be adequately treated with one dose (2.4 million units intramuscularly) of Benzathine Penicillin G (CDC, 2021). Those that have late latent Syphilis can be treated with 3 separate doses of 2.4 million units of Benzathine Penicillin G (delivered intramuscularly) given at 1-week intervals (CDC, 2021). Pregnant women must receive their latent Syphilis injections exactly 7 days apart, otherwise they must repeat the course of antibiotics. For those that are allergic to penicillin, they must be desensitized in the hospital given that there is no effective alternative treatment (CDC, 2021).

Babies born with Syphilis can be treated with Aqueous crystalline penicillin G at a dose of 100,000-150,000 units per kilogram body weight per day (kg body weight/d). It is typically given as 50,000 units/kg body weight/d intravenously every 12 hours during the first 7 days postpartum and every 8 hours after for a

total of 10 days (CDC, 2021). Alternatively, newborns can be given Procaine penicillin G at 50,000 units/kg body weight/d intramuscularly daily for 10 days (CDC, 2021). The doses given to a baby with Congenital Syphilis may be different depending on the severity of their situation.

To avoid Congenital Syphilis, women must be adequately treated prior to giving birth. There may be multiple reasons women are not treated for Syphilis during their pregnancy. One reason is lack of access to prenatal care. It is required by law that all women get screened for Syphilis during their first prenatal visit (CDC 2021). Given that this mandatory testing is required only during the first prenatal visit, doctors do not usually see the need to repeat testing during second or third trimesters. Therefore, this may lead to missed opportunities for diagnosis. The CDC states that repeat Syphilis screening at 28 weeks and again at delivery can help reduce the incidence of Congenital Syphilis (CDC, 2020), particularly among those below the federal poverty level.

Advocating for regular screening is important, not only for pregnant women, but also their partners. Regular screening may lead to reduced rates of reinfection (CDC, 2020). Due to the low-socioeconomic status of women in San Bernardino County, Congenital Syphilis can be a high-risk scenario. Therefore, improving prenatal and female reproductive care will lead to better health outcomes for both mom and baby.

Purpose of Study

The Purpose of this study is to investigate the increase of Syphilis cases in pregnant women and Congenital Syphilis cases in babies in San Bernardino County. Acknowledging this increase can give insight into the primary and secondary prevention used in provider's offices. Data from the county were analyzed to assess those treated and followed-up.

Research Questions:

1. How has the lack of primary and secondary prevention affected pregnant women in low socio-economic locations when diagnosed with Syphilis within the past 7 years?
2. In the past 7 years how has Syphilis in women and babies risen in areas of lower socio-economic status?
3. Are pregnant women of lower socioeconomic status aware of the resources available when staged with a Syphilis infection?
(Knowledge)
4. Among pregnant women and babies being born with Syphilis, is there a likelihood of reducing congenital syphilis after both the patient and provider are aware of the complications that can arise without adequate treatment? (Attitude)
5. How often are women being screened for Syphilis during their pregnancy term? (Practice)

To answer these questions, a secondary analysis was conducted using data gathered from San Bernardino County, Department of Public Health using the CalREDIE database. Data were taken from the years 2016 to 2022.

Significance to Public Health

Sexually transmitted diseases are on the rise and in 2021, chlamydia, gonorrhea, and Syphilis were increasing in the United States (CDC, 2023). Both Syphilis and Congenital Syphilis cases are on a steady increase from 2017 to 2021 throughout the United States (CDC, 2023). Untreated Syphilis in women can cause potential health threats to both themselves and their offspring. This study is significant in that it will gather data and evidence of cases throughout San Bernardino County. The data from the past several years can help look at the trend of Syphilis cases in pregnant women and how it extends to their baby. It can aid in looking closely at the resources needed for women in the county. It can show how providers are following through with their patients and whether they are doing enough to make sure adequate treatment is being administered.

The proposed study encompasses three MPH competencies to meet Public Health accreditation standards. The first competency is interpreting results of data analysis for public health research, policy, or practice. Interpreting results from the secondary data provided by the Department of Public Health (DPH) will aid in public health research as the data were analyzed using the Statistical Package for the Social Sciences (SPSS). The second competency is explaining the social, political, and economic determinants of health and how they contribute

to population health and health inequalities. This research is focused on a county that has a high poverty rate where individuals face low socioeconomic status which negatively impacts their health. The third and final competency is discussing the science of primary, secondary, and tertiary prevention in population health, including health promotion, screening, and treatment. The research will look at the importance of primary and secondary prevention in population health, specifically the regular screening of pregnant women and the proper education of the complications that come with untreated Syphilis.

CHAPTER TWO

LITERATURE REVIEW

Syphilis is considered a sexually transmitted infection that is caused by the bacterium *Treponema pallidum* (T. pallidum) (CDC, 2022). The Syphilis Spirochete bacterium is known for its immune invasion for those infected. The bacteria are uncultivable and slow growing, it can only be transmitted through close personal contact, like having sex with a person who has a Syphilitic lesion (Radolf, J.D. et. al 2016). In 2008, 11 million people had acquired Syphilis globally, where 2 million were pregnant causing mother-to-child transmission (Radolf, J.D. et. al 2016).

Nationally, Congenital Syphilis cases from 2015 to 2019 increased from 12 to 49 cases per 100,000 live births (CDC, 2021). California has the 6th highest rate of Congenital Syphilis in the United States, where in 2020 there were 107 per 100,000 live births (Hwang, K. 2022). Since 2015, Congenital Syphilis rates in San Bernardino County have increased when compared to California and the United States. There was a sharp increase between 2015 and 2016, reaching a high of 64 cases per 100,000 residents and 2016 and 2017, reaching a high of 100 cases per 100,000 residents (CDC, 2023). The only way to prevent Congenital Syphilis is by screening and treatment of pregnant women who have tested positive for Syphilis. There are state laws that require pregnant women to get testing, the legal requirement for screening pregnant women depends on the

state and whether women are at an increased risk (CDC, 2021). There are three visits in every state that show whether screening is needed or not, that consists of the first visit, the visit during their third trimester, and during delivery. In California, screening is only required during the first visit. States such as Texas and Arizona are required to do screenings on pregnant women during all three visits (CDC, 2021). California only requiring testing at the first prenatal visit can cause more increased danger in the baby having Congenital Syphilis, as stated by the CDC, the best way to prevent Congenital Syphilis is to test more often during a pregnancy.

The incubation period for Syphilis ranges from 9 to 90 days, where usually the infection begins with a chancre (or sore) on the site used during transmission, which is known as primary Syphilis. This chancre goes away with or without treatment, it is without treatment that 4 to 10 weeks later a specific rash will appear, known as secondary Syphilis (Radolf, J.D. et. al 2016). It is during secondary Syphilis where there is a greater risk of transmitting the disease mother-to-baby in utero. *T. pallidum* is considered one of the most harmful subspecies of bacteria due to it traversing blood-brain and maternal-fetal placental barriers (Radolf, J.D. et. al 2016). It is also during this stage where it has the greatest burden in the blood, causing higher titers in a serodiagnosis test (Radolf, J.D. et. al 2016). The infection differs in its latency, there is early latent and late latent. Early latent is where the infection can be seen as contagious whereas latent infectious relapses are unlikely (Radolf, J.D. et. al 2016). To find

out if an individual has Syphilis in the early or latent stage, two laboratory tests are needed. One test consists of a nontreponemal test such as a Venereal Disease Research Laboratory (VDRL) test or rapid plasma reagin (RPR) test. The other test needed is a treponemal test, such as a T. pallidum passive particle agglutination (TP-PA), this is also known as a confirmatory test (CDC, 2022).

Without adequate treatment the infection can advance to tertiary Syphilis, this includes gummas, cardiovascular, and late neurosyphilis. Gummas Syphilis are tumor-like lesions that ulcerate and can cause pain and disfiguring scars (Rawston, S.A, et al, 2023). Cardiovascular Syphilis ranges from an aneurysm being found in the aorta, aortic insufficiency, and coronary artery disease (Rawston, S.A, et al, 2023). Neurosyphilis can occur at any stage of the infection, this includes ocular Syphilis and otosyphilis (CDC, 2022). It is usually during these stages where the bacteria infect parts of the body in a more serious manner. To test for Syphilis that is more progressed, a more invasive testing is needed. For example, to test for Neurosyphilis, a Cerebrospinal Fluid (CSF) examination is necessary (CDC, 2022). When there is cause for speculation, tests are needed to determine whether a patient needs treatment for Syphilis. Testing for STDs is considered secondary prevention. Both Primary and Secondary prevention is vital when looking at patients considered higher risk, especially when a patient is pregnant.

According to the CDC, it is recommended that providers follow the idea of Talk, Test, Treat (CDC, 2023). The first idea is talking which consists of gathering

sexual history, a provider should create a trustful environment where patients feel that they are in a safe space to talk openly. Testing is recommended differently depending on the demographic. It is recommended that Adults and children ages 13 to 60 get tested at least one time in their lifetime for HIV. Women and men that are sexually active or who share injection drug equipment should be regularly tested for gonorrhea and chlamydia at least once a year. This is especially true for sexually active gay and bisexual individuals. When there are multiple anonymous partners, it is recommended by providers that they get tested more frequently, such as every 3 to 6 months (CDC, 2023). Everyone who is pregnant should be tested for Syphilis, HIV, Hepatitis B, and Hepatitis C early on in their pregnancy, and, according to the CDC, repeat testing may be needed only in some cases (CDC, 2023). After getting tested, treatment should be followed as necessary according to the 2021 STI Treatment Guidelines, which acts as the most current recommendations for treating patients (CDC, 2023). Expedited Partner Therapy (EPT) is an option if there are cases where a patient's partner is unable to access care or if they are unwilling to access care. These cases are specific to case-by-case scenarios. It is important that Providers get contact information from the patient so that they may be easily contacted for any follow-ups needed. This is especially important for homeless individuals who are often seen initially due to symptoms and a routine STD panel but are never followed up with, due to bad locating information.

A study from Kern County in California and East Baton Rouge Parish in Louisiana showed that there were reported inconsistencies in getting proper patient-centered care for pregnant women. These inconsistencies were usually tied to lack of ethnic and cultural competency among providers as well as negative attitudes towards lower-income, high risk individuals, such as sex-workers, those using substances, and the homeless (Wagman, J.A. et al, 2022). Although this is not always the case, there are many health systems where there is an obvious gap in prenatal care and getting Syphilis testing and treatment. The study found that the social stigma of being considered a high-risk population came with an implicit bias from providers. Women that are Hispanic, African American, or of immigrant status, to name a few, are a common demographic in these 2 counties and have often felt that they could not trust their provider (Wagman, J.A. et al, 2022). Without this trust, it is more likely that pregnant women will not feel comfortable returning and following recommendations set forth by the provider. According to the CDPH, San Bernardino County has been disproportionately impacted by Congenital Syphilis over the past few years. It is usually women who are at higher risk that may find themselves struggling to get the best care.

This study will employ the Knowledge, Attitude, and Practice (KAP) model to identify knowledge gaps and behavioral patterns. The Knowledge question in KAP is, *are pregnant women of lower socioeconomic status aware of the resources available when staged with a Syphilis Infection?* With the article from

Wagman in mind, many women can possibly feel that due to their socioeconomic challenges, proper prenatal care may seem out of reach. The Attitude question in KAP is, *among pregnant women and babies being born with Syphilis, is there a likelihood of reducing congenital syphilis after both the baby and provider are aware of the complications that can arise without adequate treatment?* Many Pregnant women can be first time mothers and afraid of seeking help, this can be due to their status, place of employment, or because they are substance users. They may find a hard time trusting their provider and going against medical advice due to any bias they feel. The Practice question is, *how often are women being screened for Syphilis during their pregnancy term?* Advocating for screening leads to the prevention of congenital syphilis, however, on many occasions women are being screened only once during their pregnancy. Due to the law in California that states Screening is only required during the first prenatal visit, some women are at the risk of not getting screened later, which can negatively impact their health and that of their unborn child.

CHAPTER THREE

METHODS

Study Design

This study used a quantitative research method by conducting an assessment based on secondary data collected from case state/county findings. Data was analyzed prospectively from reported cases according to Public Health records.

Data Source and Collection

The data were collected with the help of the San Bernardino County Department of Public Health. Data were collected using CalREDIE, a statewide condition reporting system. This system allows users to report results for patients tested directly to the local health department where the Patient resides (*CalREDIE Manual Laboratory Reporting Module, 2020*). Syphilis is a reportable disease, every positive reporting is sent to the county and monitored until the patient either receives treatment or they are deemed lost to follow up. Epidemiologists gather congenital syphilis reports and determine who was able to be treated and who have been lost to follow up.

The gathered case incidents consisted of women who were pregnant, and the baby linked to the mother's original Syphilis incident. The demographics represented by the sample population was withheld as each case was represented with a CalREDIE incident number. There was no age or race

specified, as the data was only looking at women who were pregnant and tested positive for Syphilis during the years of 2017 through 2022. The data was presented through an excel sheet, where it showed the year a woman was pregnant, the resolution status, the final disposition of the case, and whether the case was treated. The same data was presented for the Congenital Syphilis cases. It showed the baby's resolution status, the final disposition, and whether the mother was adequately treated during pregnancy. There was a total of 514 women linked with their child for a positive Syphilis diagnosis.

Measures and Data Analysis

The quantitative variables consisted of a single gender and their reproductive abilities. The results depended on whether the women had received treatment, which determined whether their baby was presented as a Congenital Syphilis case. Pregnant women are required by law to have Syphilis tests done at least once during pregnancy. All positive Syphilis reports in San Bernardino County are then sent over to the Department of Public Health by their provider and reported through CalREDIE. The Department of Public Health assigns a Communicable Disease Investigator (CDI) to a positive Syphilis case from CalREDIE, where they will ensure that both mom and baby are adequately treated.

Ethics

This study was done retrospectively. Secondary data were collected through an existing database, which through IRB was determined to not fall under the definition of human subjects' research, the protocol for this study is No/Not Human Subjects Research (NHSR). See Appendix A.

CHAPTER FOUR

RESULTS

Characteristics of Participants

Within this sample, a total of 514 pregnant women tested positive for Syphilis. Each woman in the Data set was linked to 1 infant. There are no demographic factors that separates the women from each other, the data set is strictly looking at their pregnancy status, syphilis resolution status, and final disposition. The same goes for the baby linked to the mom, the only information provided shows their resolution status and final disposition. The resolution status discusses whether the Syphilis test was probable or confirmed and the final disposition explains whether the patient followed through with adequate treatment or whether they were lost to follow up. This data set was taken from reported cases in San Bernardino County only.

Syphilis cases are reported with multiple factors. Table 1 describes the frequency of Syphilis incidents among pregnant women yearly. From 2016 to 2021, there were a total of 514 cases. In 2016 5.4% of pregnant women tested positive for Syphilis in SB County. Since then, there was a gradual increase whereby in 2020 a total of 133 (25.9%) pregnant women tested positive. The numbers went down slightly in 2021 with a total of 122 (23.7%) positive Syphilis cases. Data also included Congenital Syphilis cases (see Table 2). Each Mom within Table 1 is linked to a baby (congenital syphilis case). Table 2 shows

differences from Table 1 due to some data not being reported. Table 1 does not have data in 2022, this is due to women who were pregnant in 2021 giving birth in 2022. The trend is similar for Table 2 as it was for Table 1, where it shows the gradual increase from 2016 (4.9%) to 2021 (26.3%).

Table 1. Frequency of Syphilis incidents among pregnant women by year.

Year	Number of Syphilis cases n (%)
2016	28 (5.4)
2017	44 (8.6)
2018	84 (16.3)
2019	103 (20.0)
2020	133 (25.9)
2021	122 (23.7)

Table 2. Frequency of Congenital Syphilis incidents among infants by year.

Year	Number of Congenital Syphilis Cases n (%)
2016	25 (4.9)
2017	41 (8.0)
2018	56 (10.9)
2019	116 (22.6)

2020	113 (22.0)
2021	135 (26.3)
2022	28 (5.4)

Data also identified in which Syphilis stage the woman was in. The two stages of Syphilis that pregnant women from 2016 to 2021 have been staged as were Unknown Duration or late (75.5%) and Early Syphilis (24.5%). Being Unknown Duration or Late means that women have had the infection for longer than a year and are no longer symptomatic whereas Early Syphilis cases mean that women have had the infection for less than a year (see Table 3). Table 4 indicates whether the women were treated or not (final disposition). Follow-up completed means that the woman was followed through until adequately treated whereas Lost to follow up means that the woman did not get adequately treated. In simpler terms Table 5 describes whether women were treated or not, most women were treated (88.7 %). Data also show whether the resolution status is probable or confirmed. In CalREDIE, Probable cases are more common than confirmed cases. Getting confirmed tests consist of using a dark field, which in many cases is not as accessible as treponemal and nontreponemal tests being used in most laboratories. There are 98.6 % of probable cases and 1.4 % of confirmed cases in this data set (see Table 6).

Table 3. Frequency of Syphilis stage among pregnant women

Syphilis Stage	Number of Syphilis Cases n (%)
Syphilis (Unknown Duration or late)	388 (75.5)
Early Syphilis	126 (24.5)

Table 4. Frequency of final disposition among pregnant women

Final Disposition	Number of Syphilis Cases n (%)
Follow-up Completed	361 (70.2)
Lost to Follow-up	116 (22.6)
No Follow-up Needed	2 (.4)
Administrative Closure	1 (.2)

Table 5. Frequency of pregnant women treated

Treated	Number of Syphilis Cases n (%)
Yes	456 (88.7)
No	52 (10.1)

Table 6. Frequency of resolution status among pregnant women

Resolution Status	Number of
-------------------	-----------

	Syphilis cases n (%)
Probable	507 (98.6)
Confirmed	7 (1.4)

The Congenital Syphilis cases also show data for the final disposition and the resolution status. Most Congenital Syphilis cases had their final disposition set as follow-up completed (82.3 %, see Table 7). The final disposition and resolution status corresponds to how the infection progresses as primary and secondary prevention are concerned. The Resolution status shows 48.4% of cases were Probable and 51.4% of cases were Not a case (see Table 8). The babies' status depended on whether the mom was treated adequately during pregnancy and when they were treated during their pregnancy. More women were treated during pregnancy (59.7%) versus women that were not treated (32.1%, see Table 9). Being adequately treated can depend on the timeline of pregnancy, if three shots are needed then one must start at a reasonable time to make sure it is finished prior to giving birth, this corresponds to whether babies are being born with congenital syphilis which results in the rise of syphilis throughout the years. The women adequately treated during pregnancy (46.9%) and those labeled as unknown (41.1%) make up most of the frequency (see Table 10).

Table 7. Frequency of final disposition among Congenital Syphilis cases.

Final Disposition	Number of Syphilis cases n (%)
Follow-up Completed	423 (82.3)
No Follow-up Needed	6 (1.2)
Lost to Follow-up	20 (3.9)
Record Search Closure	1 (0.2)

Table 8. Frequency of resolution status among Congenital Syphilis cases.

Resolution Status	Number of Congenital Syphilis Cases n (%)
Probable	249 (48.4)
Not a Case	264 (51.4)
Suspect	1 (.2)

Table 9. Frequency of mom treated during pregnancy.

Treated During Pregnancy	Number of Syphilis Cases n (%)
Treatment During Pregnancy	307 (59.7)
No Treatment	165 (32.1)
Unknown	23 (4.5)

Treatment Before Pregnancy	19 (3.7)
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Table 10. Frequency of mom adequately treated during pregnancy.

Adequately Treated During Pregnancy	Number of Syphilis Cases n (%)
No, tx started >30 before delivery	38 (7.4)
Unknown	211 (41.1)
Adequately Treated	241 (46.9)
Not adequate for stage	24 (4.7)

Research Question 1

The Hypotheses for the first research question are as follows:

H₀: Women who test positive for Syphilis and are receiving treatment do not differ from pregnant women who receive treatment.

H₁: Women who test positive for Syphilis and are receiving treatment differ from pregnant women who receive treatment.

The research question, *how has the lack of primary and secondary prevention affected pregnant women in low socio-economic locations when diagnosed with Syphilis within the past 7 years*, corresponds to whether moms are receiving treatment and whether they are receiving it in an appropriate time frame. The frequency of mom being treated during pregnancy shows that 307 (59.7%)

received treatment during pregnancy and 165 (32.1%) received no treatment, the rest either being treated before or unknown. With the majority being treated (88.7%) versus not treated (10.1%), a chi-square test was completed, and the results are statistically significant ($P < .001$). The frequency of mom being adequately treated during pregnancy shows that 241 (46.9%) were adequately treated and 38 (7.4%) were not adequately treated due to treatment not starting at an appropriate time frame before giving birth. The rest of the cases in this frequency are either unknown (41.1%) or not adequately treated for their stage (4.7%). The frequency of whether the mom was adequately treated was compared to the frequency of the women being treated (88.7%) or not treated (10.1%), as stated previously. Using a Chi square test, it was found to be statistically significant ($P < .001$) and, therefore, a rejection of the null hypothesis, suggesting that the results are unlikely due to chance.

Research Question 2

The Hypotheses for the second research question are as follows:

H_0 : The number of women testing positive for Syphilis do not differ by year of diagnosis.

H_1 : The number of women testing positive for Syphilis differ by year of diagnosis.

H_0 : The number of Congenital Syphilis cases do not differ by year of diagnosis.

H_1 : The number of Congenital Syphilis cases do not differ by year of diagnosis.

Research Question 2, How has Syphilis in women and babies risen in areas of lower socioeconomic status in the past 7 years, can be described using the Final

disposition of pregnant women throughout the years. The final disposition among pregnant women was 361 (70.2%) follow-ups completed and 116 (22.6%) lost to follow-up. To determine whether there were significant differences between groups of women with syphilis, an ANOVA test was run. The results showed that there was no significant difference between the groups ($F(3) = .276, p = .878$). Another ANOVA test was run to determine whether there was any difference when taking out data of the 2 (0.4%) lost to follow-up and the 1 (0.2%) administrative closure, it also showed that there was no significant difference between the groups ($F(1) = .259, p = .611$), therefore the original ANOVA results were included. This same process was used to determine whether there were significant differences between groups of Congenital Syphilis cases. Results revealed that there was no significant difference between the groups ($F(3) = .340, p = .796$). As mentioned above, another test was run while taking out 1 (0.2%) record search closure case and it also showed that there was no significant difference between the groups ($F(2) = .086, .918$), therefore the first ANOVA results were used. There being no significant difference fails to reject the null hypothesis, indicating that the number of categories will be the same throughout the years 2016-2021.

CHAPTER FIVE

DISCUSSION

Discussion

In relation to the Research question, *how has the lack of primary and secondary prevention affected pregnant women in low socio-economic locations when diagnosed with Syphilis from 2015-2021*, the data were gathered from a location that has a large population of low socioeconomic status. It is usually perceived that women who have tested positive for STDs are at higher risk for using substances and being homeless. This study focused primarily on the number of Syphilis cases in San Bernardino County from 2016-2022, the information was generalized as low-socioeconomic status according to the latest Census data which reveals that San Bernardino County has a poverty rate of 13% which is higher than the national average (San Bernardino County, 2023). It was generalized due to the fact that no demographic information was used, this was to keep the identity of the women and babies hidden. As Syphilis continues to increase in San Bernardino County, regular screening and safe sex practices are always recommended.

The three components of KAP (Knowledge, Attitude, and Practice) help in giving a closer look into different health behaviors and explain any changes in behavior. The knowledge question asks, *are pregnant women of lower socioeconomic status aware of the resources available when staged with a*

Syphilis infection? As the data shows that most women were treated for Syphilis, it can be inferred that resources were available. However, there was a percentage that was not treated as a whole and a separate category for women who were treated but not adequately treated in time for giving birth. In this case, it can be assumed that women were not aware of the resources available according to their Syphilis stage. The study done in Kern County and East Baton Rouge Parish notes the barriers to prenatal care and maternal Syphilis. They realized the inconsistencies in patient care when it came to women of lower income, specifically those using substances, facing homelessness, or engaging in sex work (Wagman, J.A. et al, 2022). Women who are homeless or using substances could benefit greatly from resources, but as women are not treated and not given the proper follow-up, more Congenital Syphilis cases occur (Wagman, J.A. et al, 2022). Resources such as health education, local free clinics, housing, psychiatric help, and more could aid a woman who may not understand their condition and the dangers it can cause to a fetus (Thorton, C. et. al. 2022). A study done in Chicago saw that women who were dealing with psychiatric illness were more likely to deliver babies with Congenital Syphilis (Thorton, C. et. al. 2022). The high-risk factor of psychiatric illness was correlated to substance abuse, homelessness, and high-risk sexual activity (Thorton, C. et. al. 2022).

The Attitude question in KAP asks, *among pregnant women and babies being born with Syphilis*, is there a likelihood of reducing Congenital Syphilis after

both the patient and provider are aware of the complications that can arise without adequate treatment? In the database *CaIREDIE*, there are different dispositions that show whether patients were follow-up completed or lost to follow-up and whether they were treated or not treated. The data show that women with the final disposition of follow-up completed, were most likely aware of the complications and given recommendations for adequate treatment. This can be assumed since follow-up completed means they have been followed through the entirety of their infection and adequately treated. Being that *CaIREDIE* is used in the Department of Public Health, a Public Health worker is responsible for following through with each case (California Reportable Disease Information Exchange, 2022). The 70.2% of women that were follow-up completed meant that the babies they gave birth to were most likely follow-up completed.

It is usually those that were lost to follow up that are not aware of their positive Syphilis test and not given adequate treatment. The Health Belief Model may explain the reasoning for women not returning for treatment and remaining lost to follow up. In theory, the three categories that represent the motivation of someone's health behavior are individual perception, modifying factors, and likelihood of action (Mckellar, K. et al 2020). The perceived susceptibility, perceived severity, and the overall health aid in understanding change of behaviors when it comes to health (Mckellar, K. et al 2020). The likelihood of action puts the perceived benefits and barriers into account where an individual

determines whether they follow through with the recommended health action (Mckellar, K et al 2020). Women who test positive and do not seek care may feel as though the barriers outweigh the benefits.

The Practice question asks, *how often are women being screened for Syphilis during their pregnancy term?* Every woman presented in the data set was screened at least once during their pregnancy. The women with the final disposition of follow-up completed were screened and adequately treated. The women that were lost to follow-up (not treated) could have benefited from more than one screening to ensure treatment. Women who gave birth to positive Congenital Syphilis cases may not have been screened as needed. A study discussing screening for pregnant women discusses whether screening throughout the pregnancy can be due to the provider failing to follow through with the patient (Hardin, W.P. et. al., 2019). As California has the requirement to screen during the first prenatal visit, it is recommended that women who are considered higher risk to get tested more often (Wagman, J.A. et al, 2022). However, with lost to follow up cases and providers possibly treating prophylactically, women may not be aware to get screened for Syphilis again during a later trimester to rule out any reinfection. Research shows that women who were treated early on or were negative for syphilis during early stages of pregnancy may end up testing positive Syphilis closer to delivery, therefore regular screening throughout the entire pregnancy is vital (Rubin, R. 2019). It could also be that they were treated but re-infected and not screened during their

third trimester or delivery. If reinfection occurs and women are not aware, the dangers of congenital Syphilis increases, such as gummas, cardiovascular, and Neurosyphilis.

The study found that the mom being treated during pregnancy had a statistically significant influence on general treatment overall. Most women were treated in the data, but whether they were treated during their pregnancy determines the outcome of their baby. It also showed that mom being adequately treated during pregnancy had a statistically significant influence on general treatment overall. Being adequately treated represents the timeline and whether treatment was being administered in a timely manner, which again can affect the outcome of the baby. Among the 514 cases studied, the variables of being treated during pregnancy, overall treatment, and the time in which they were treated all have a relationship and are unlikely due to chance. The final disposition for both the pregnant women and congenital cases throughout the years showed no significant difference between groups, there was no distinct difference from the overall group mean.

Significance to Public Health

Sexually Transmitted Infections (STIs) are a constant health issue in the United States as people continue to have sex with multiple partners, with no protection. Pregnant women with untreated STIs carry the risk of passing the infection to their fetus in utero. Accessing quality sexual health services and the mistrust of healthcare systems often leads people to not seek health care (CDC,

2020). As more women are negatively affected than men when it comes to their reproductive health, more preventive measures need to be taken (CDC, 2023). Syphilis in general can have lifelong impacts on the health of an individual, such as neurosyphilis or gummas Syphilis (Rawstron, S.A et al 2023). Babies born with Congenital Syphilis are often left with life-threatening, but avoidable conditions. The data shows how pregnant women from the past seven years are being followed up by Public Health officials (CDIs), as mentioned through the database CalREDIE. Provider's screening women regularly and reaching out to offer resources can prevent serious complications with syphilis and other STIs. Advocating for women of lower income can make a difference in how women view the health system. The use of CalREDIE shows that the Department of Public Health is ensuring the wellbeing of pregnant women infected with Syphilis. Analyzing past data can help in understanding what went wrong and how future Public Health officials can lessen the risk of Congenital Syphilis.

Strengths and Limitations

Strengths in this study include the use of secondary data that has been gathered from San Bernardino County since 2016, where a large set of cases were collected. A large sample size of $N = 514$ allowed for a better understanding of the trend throughout the years. This data was collected by Epidemiology from the Department of Public Health. It was taken from an existing database, CalREDIE, which is a statewide condition reporting system. CalREDIE is a credible site in which all positive cases are reported and monitored.

Epidemiology from the County filtered all data which allowed for it to be cleaned and sent for review and analysis. The sample obtained gave a generalized look throughout the county, helping in making predictions based on observations.

The limitations of this study should also be noted. Although the information provided was helpful in generalizing the data, there was a lack of demographic information. Demographics such as race, ethnicity, age, etc., could have aided in the understanding of the populations being most affected throughout the county. As socio economics is an important aspect to the research, it was generalized that the entire county, specifically the data set of cases, are in the category of lower socioeconomic status. In the data provided, the ethnicity and age of the women is not known, what is known is their positive Syphilis and pregnancy status. The data was limited in the way that demographic categories could have added another analysis and given another perspective for specific populations.

Recommendations

As Syphilis rates are increasing in San Bernardino County and the state of California, there is a higher risk of congenital syphilis cases. Some recommendations to the general public include STD testing every 3 months, monogamous relationships, and abstinence (CDC, 2022). However, as these recommendations are easier said than done, a closer look into testing for pregnant women is needed. With the increase of cases, Syphilis tests should be required at every trimester to avoid perinatal mortality and the negative consequences of untreated Syphilis (Shahrook, S. et al 2014).

Future research should be done using qualitative data that will capture more detailed information from study participants who have tested positive from Syphilis. Investigations can be done to receive information regarding their experience with testing, prenatal care, and receiving education on high risk factors. More information should be gathered as to how the infection was transmitted and why women were lost to follow-up. Surveys should be included so that, with their permission, age and race are collected. Questionnaires could be sent out to Providers to capture an understanding of their protocol for aiding positive Syphilis cases for pregnant women. Assessing for reinfection may also be helpful in viewing the screening process of different providers.

Conclusion

The results of this study suggest that in the past seven years, the number of positive Syphilis tests in women and babies in San Bernardino County have increased with time. Being tested and treated are often the responsibility of both the patient and provider, which shows that primary and secondary prevention in low-socio economic areas is improving. The increase of cases throughout the years can either mean that more women are testing positive or that more women are given the choice to be screened than previous years. Although the study showed that most women were treated, there were still cases left untreated for both the mother and baby. As more tests are positive, more treatment will need to be administered to prevent Congenital Syphilis. More tests being ordered suggests regular screening, which is the best preventative measure for

Congenital Syphilis. As prevention may be on the rise, more communication between DPH and health care facilities can help in dispensing resources. Overall, the data can help influence the reproductive health of many women as well as the long-term health of babies.

APPENDIX A:
IRB REVIEW



March 29, 2023

CSUSB INSTITUTIONAL REVIEW BOARD
No Human Subjects Research (NHSR) Determination
IRB-FY2023-247
Status: NHSR Determination

Prof. Neal Malik and Ms. Valerie Alfaro
CNS - Health Science
California State University, San Bernardino
5500 University Parkway
San Bernardino, California 92407

Dear Prof. Neal Malik and Ms. Valerie Alfaro:

Your application titled "How has the lack of primary and secondary prevention affected pregnant women of low socio-economic status when diagnosed with Syphilis within the past 5 years?" has been reviewed by the Chair of the Institutional Review Board (**IRB**) of California State University, San Bernardino and has determined that your application does not fall under the definition of human subjects research and, as written, your protocol is No/Not Human Subjects Research (NHSR). The **IRB** NHSR determination means that your project is not research and/or not research with human subjects as defined by the Office of Human Research Protections (OHRP) under [\[hhs.gov\]45 CFR 46.102 \[hhs.gov\]](https://www.hhs.gov/45-cfr-46.102) noted below.

The OHRP defines research as:

A systematic investigation, including research development, testing, and evaluation, designed to develop or contribute to generalizable knowledge.

- A *systematic investigation* is an activity that is planned in advance and that uses data collection and analysis to answer a question.
- *Generalizable knowledge* is information that expands the knowledge base of a scientific discipline or other scholarly field of study

A *Human subject* means a living individual about whom an investigator (whether professional or student) conducting research obtains:

- (1). Data through intervention or interaction with the individual, or
- (2). Identifiable private information.

An *Intervention* includes both physical procedures by which data are gathered and manipulations of the subject or the subject's environment that are performed for research purposes. Interaction includes communication or interpersonal contact between investigator and subject.

Private information includes information about behavior that occurs in a context in which an individual can reasonably expect that no observation or recording is taking place, and information which has been provided for specific purposes by an individual and which the individual can reasonably expect will not be made public (for example, a medical record). Private information must be individually identifiable (i.e., the identity of the subject is or may readily be ascertained by the investigator or associated with the information) in order for obtaining the information to constitute research involving human subjects.

The CSUSB **IRB** has not evaluated your proposal for scientific merit. This approval notice does not replace any departmental or additional approvals which may be required.

If you have any questions regarding the **IRB** decision, please contact Michael Gillespie, the Research Compliance Officer. Mr. Michael Gillespie can be reached by phone at (909) 537-7588, by fax at (909) 537-7028, or by email at mgillesp@csusb.edu. Please include your application approval identification number (listed at the top) in all correspondence.
Best of luck with your research.

Sincerely,

King-To Yeung

King-To Yeung, Ph.D., **IRB** Chair
CSUSB Institutional Review Board

KY/MG

APPENDIX B:
COLLABORATIVE INSTITUTIONAL TRAINING INITIATIVE



Completion Date 20-Sep-2022
Expiration Date 19-Sep-2027
Record ID 51626558

This is to certify that:

Valerie Alfaro

Has completed the following CITI Program course:

Not valid for renewal of
certification through CME.

Human Research
(Curriculum Group)
Biomedical Research Investigators and Key Personnel
(Course Learner Group)
1 - Basic Course
(Stage)

Under requirements set by:

California State University, San Bernardino



Verify at www.citiprogram.org/verify/?w2a9d57c3-fcaf-4966-93a5-a81867a4926b-51626558

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