SYPHILIS CONTROL AND PREVENTION IN LOUISIANA
IS SELECTIVE SCREENING ALONE OR SELECTIVE SCREENING WITH PARTNER NOTIFICATION MORE EFFECTIVE?
A COST EFFECTIVENESS ANALYSIS

A DISSERTATION

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Syphilis Control and Prevention in Louisiana

Is selective screening alone or selective screening with partner notification more effective?

A Cost Effectiveness Analysis

ABSTRACT

Objective: The objective of this research is to assess the incremental cost effectiveness of adding partner notification with selective screening in detecting early syphilis and to measure incremental cost effectiveness of intensity of partner notification in Louisiana in 2007.

Study Population: A total of 147376 persons were tested for syphilis in Louisiana in 2007 among which 1284 were diagnosed as early syphilis cases and form the sample of this study. Out of these 1284 syphilis cases, 1005 cases were detected by selective screening and an additional 279 cases were detected by partner notification.

Method: The cost effectiveness analysis was done from the point of view of health care delivery. Micro costing approach was taken in cost analysis and the cost effectiveness analysis was performed by using the recurring direct costs associated with detecting syphilis by selective screening alone and selective screening with partner notification. Cost was calculated for every steps involved in case detection by both strategies and effectiveness was calculated by the number of syphilis cases detected.

Finally, the incremental cost effectiveness was calculated for adding partner notification with selective screening.

For incremental cost effectiveness of intensity of partner notification, cost was calculated for every attempt made to contact a partner and effectiveness was calculated from the number of partners identified as well as the number of cases identified through partner notification. Finally, the incremental cost effectiveness of intensity of partner notification was calculated.

Results: The estimates for the total direct costs associated with selective screening alone was $ 6356724 for 1005 early syphilis cases detected and for selective screening with partner notification was $ 6671222 for 1284 early syphilis cases detected. Partner notification detected additional 279 early syphilis cases with an additional cost of $314498.

Incremental cost effectiveness finding shows that adding partner notification with selective screening is $ 2808 for each primary and secondary syphilis case,

$ 1883 for early latent syphilis, $ 1127 for each early syphilis case and $ 20967 for each maternal syphilis case detected.

The study also showed that the more attempts are made to identify partners of infected cases, the more partners were identified implying that there was no optimal number of attempts. Average cost per case and cost per partner also went down with the increase in number of attempts. The average cost per partner identified with first attempt was $248 where as at tenth attempt

the average cost per partner was $123, The average cost per case identified with first attempt was $1848 and it went down to $553 with ten attempts. Incremental cost effectiveness of intensity of partner notification showed a mixed result. Incremental cost effectiveness of identifying partner showed a decline with the increase in number of attempts but the incremental cost effectiveness of case detection through partner notification did not show a definite pattern of the cost decreasing or increasing with number of attempts made.

Conclusion: This study demonstrates that adding partner notification with selective screening is more cost effective in syphilis detection in Louisiana compared to case detection by selective screening alone. In terms of intensity of partner notification, it was found that increased attempts were cost effective in identifying partners but the study was unable to detect whether it was cost effective in detecting cases by increasing the number of attempts.

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I dedicate this dissertation to my family.

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CHAPTER 1

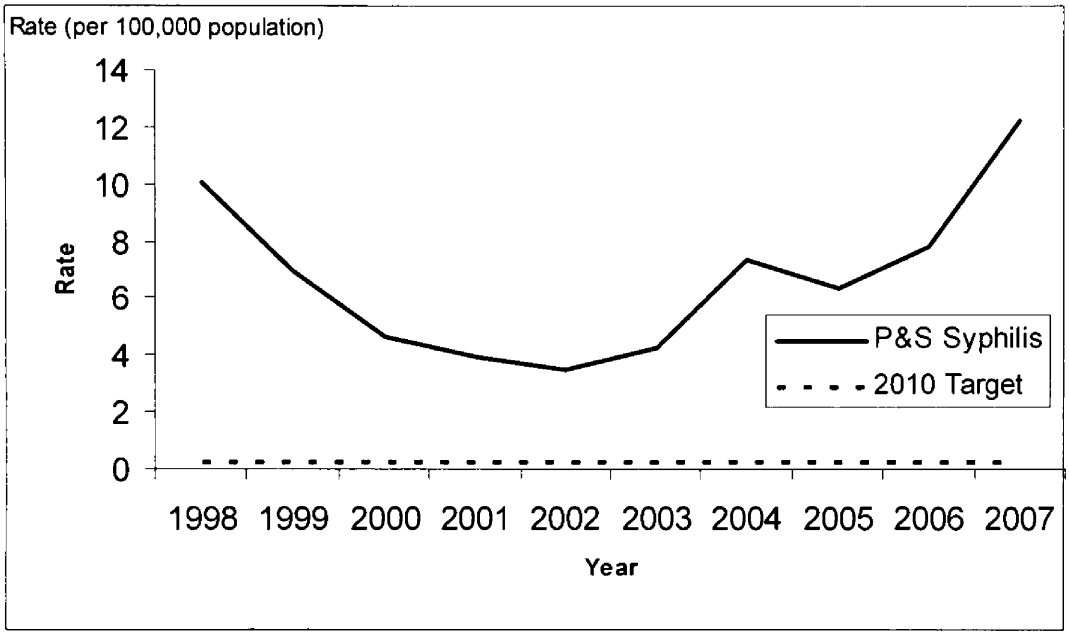
INTRODUCTION

Syphilis, a genital ulcerative disease, is highly infectious, but easily curable in its early stages. If untreated, it can lead to serious long-term complications including brain, cardiovascular, and organ damage, and even death. Untreated early Syphilis in pregnant women results in perinatal death in up to 40% of cases and, if acquired during the four years preceding pregnancy, may lead to infection of the fetus in 80% of cases. Syphilis, like many other STDs, facilitates the spread of HIV by increasing the likelihood of transmission of the virus.

The rate of primary and secondary [P&S]syphilis reported in the United States decreased during the 1990s, and in 2000, the rate was lowest since reporting began in 1941.Although the rate of P & S syphilis declined 89.7% between 1990 and 2000, the rate of P & S Syphilis has been increasing since 2001.

Syphilis remains an important problem in the South. Louisiana ranked first among all the states for P& S Syphilis case rate in 2006 & 2007. Louisiana experienced an increase in Syphilis rate since 2002 which was 4.1 per 100,000 populations and went up to 12.4 per 100,000 populations in 2007.

Fig 1: Primary and Secondary Syphilis case rates in Louisiana, 1998-2007



In comparison with the number of reported cases of P&S syphilis cases in the year 2006 (342 cases), the number of reported cases increased by 59.9% in 2007 (547 cases).

Detection of cases followed by treatment has always been considered the cornerstone of syphilis control .US Surgeon General Thomas Parran proposed national screening and contact tracing program in 1936, as part of the federal anti-venereal disease program. Since then mass screening has evolved into selective screening and contact tracing has become known as partner notification.

Individuals, symptomatic or asymptomatic, who were initially tested for Syphilis on the basis of risk history at public STD, prenatal, and family planning clinics,

jails, hospitals and other private provider sites as part of a routine screening program, are classified as cases detected through selective screening. Individuals who are tested as part of active case finding are classified as cases detected by partner notification. In fact, partner notification which is also widely known as contact tracing is the process of contacting the sexual partners of an individual with a sexually transmitted disease and advising them that they have been exposed to infection. Partner notification is done to control Syphilis in all over USA and other developed countries. Since the partners of early syphilis cases (mainly primary and secondary syphilis) are at high risk of acquiring the infection, so by partner notification they are contacted and encouraged to get tested and treated.

Partner notification helps to reduce the burden of syphilis in the community and shorten the average period of infectiousness, in the expectation that this will reduce syphilis transmission in the community.

Though selective screening and partner notification are the two strategies used by the STD control programs in USA to reduce and or eliminate syphilis but very few studies have assessed the cost and effectiveness of either approach. So far the studies assessing the cost effectiveness of screening or partner notification were done at the city or county level but none was done at the state level. All these studies were done from the perspective of a city or county health department. The current study is conducted from the perspective of health system at a state level. The direct cost and the intermediate effectiveness of

detecting early syphilis and maternal syphilis are estimated in this study. Evaluation of these two strategies of Syphilis control and prevention help in assessing the more cost effective way of controlling syphilis and to allocate funding more efficiently.

CHAPTER 2

OBJECTIVES AND HYPOTHESES

The principal objective of this study is to calculate the incremental cost effectiveness of adding partner notification with selective screening.

Before we can estimate the incremental costs, it is important to identify the major cost items and effectiveness measures. Therefore, secondary objectives of the study are related to the estimate of costs of syphilis control program and estimate of effectiveness of the program.

Cost of syphilis control program can be estimated by identifying specific "functions" of current program. There are two discrete functions of the syphilis control program in Louisiana. One of the functions is selective screening of individuals who are symptomatic or asymptomatic, initially tested for syphilis on the basis of risk history at Louisiana Office of Public Health STD clinics, family planning clinics, prenatal clinics, jails or at other public and private provider facilities. The other function is partner notification - identifying and testing individuals who are partners of cases detected through selective screening.

The cost items for selective screening include cost of testing individuals, cost of processing positive test results and cost of contacting infected patients to advise them of the need to return for treatment.

The cost items for partner notification include cost of case management, cost of surveillance and cost of serology of sexual contacts (partners) of syphilis cases. Effectiveness of syphilis control program can be estimated by the number of primary and secondary syphilis cases detected by selective screening and selective screening with partner notification.

Once all cost items and effectiveness are estimated, the cost effectiveness of syphilis case detection by either approach can be compared. Then the principal objective of this study which is incremental cost effectiveness of adding partner notification with selective screening can be calculated.

There is also one more objective in this study which measures the cost effectiveness of intensity of partner notification. This objective has been set up to see whether there is any optimum number of attempts to contact partners and whether it is cost effective to increase the number of attempts to contact the partners of infected cases.

The objectives of this study can be summarized as follows-

A. Measuring cost for selective screening -
    1. Cost of testing.
    2. Cost of processing positive test results.
    3. Cost of contacting infected patients to advise them of the need to return for treatment.

B. Measuring cost for partner notification –
    1. Cost of case management.
    2. Cost of surveillance.

3. Cost of serology of sexual contacts of syphilis cases.

C. Measuring effectiveness for selective screening and selective screening with partner notification-

-Number of primary and secondary syphilis cases detected by either approach.

D. Comparing the cost effectiveness of syphilis case detection by selective screening and selective screening with partner notification.

E. Incremental cost effectiveness of adding partner notification with selective screening

F. Measuring cost effectiveness of intensity of partner notification

HYPOTHESES

There are three research hypotheses for this study:

1. Selective screening with partner notification will have lower cost per case than selective screening alone.

2. Identifying and treating more non infected partners will result in lower cost per case for selective screening with partner notification than selective screening alone.

3. It will be less cost effective if more than three attempts are made to contact cases through partner notification.

The first hypothesis states that adding partner notification with selective screening will have lower cost per case compared to selective screening alone. The idea behind this hypothesis is that by selective screening once the cases are already identified, it will be less costly to contact the partners of these cases and new cases can be identified through partner notification. In selective screening a large number of individuals go through testing and then cases are identified among those screened. On the other hand, in partner notification, partners are initiated by interviewing the infected cases identified by selective screening. So relatively small numbers of individuals go through testing to identify cases. As a result it will be cost effective to do partner notification after selective screening.

The second hypothesis states that Identifying and treating more non infected partners will result in lower cost per case for selective screening with partner notification than selective screening alone. Even though these partners are not infected but they are always at very high risk of contracting syphilis from the infected persons. By providing preventive treatment to them, they will be able to avoid getting syphilis and thus lower the cost per case.

The third hypothesis states that it will be less cost effective if more than three attempts are made to contact cases through partner notification. The idea behind this hypothesis is that the more attempts are made, the more cost is involved thus making it less cost effective. Three attempts are considered optimum in this hypothesis.

CHAPTER 3

LITERATURE REVIEW

The literature review focuses on important aspects of the study – cost and effectiveness of syphilis control program and use of cost effectiveness ratios in policy analysis. Therefore, the first part of literature review provides a quick summary of types of economic evaluation in health and how economic analysis has been used in evidence based decision making.

Types of Economic Evaluation in Health Care System:

Economic evaluations have proliferated in various academic literatures which were evidenced by a comprehensive bibliography by Elixhauser et al in 1993. This bibliography consists of 3206 articles published from 1979 to 1990. There are four main types of economic evaluations: cost-minimization analysis; cost-effectiveness analysis; cost-utility analysis; and cost-benefit analysis. A cost-minimization analysis (CMA) compares alternative programs where all relevant outcome measures are equal (i.e., equal effectiveness or equal patient quality of life). A cost-effectiveness analysis (CEA) compares alternatives and measures (in natural units) the primary objective(s) of the program (i.e., morbidity reduction,

life years saved, functional ability on a scale). A cost-utility analysis (CUA) compares alternatives similar as in a CEA, but uses a more generic outcome measured directly on patients (i.e., quality adjusted life years-QALYs, healthy years equivalent-HYEs). This type of analysis is preferred when there are multiple objectives of a program, when quality of life is an important outcome, and when quality of life and quantity of life are both important outcomes. The primary advantage of a CUA is that the outcome measure is more generic, and this is helpful when comparing the relative merit of many different types of health care programs. The final type of analysis, cost-benefit analysis (CBA), compares alternatives by using a generic monetary outcome (i.e., dollars). The indications for using CBA are similar as for CUA (i.e., when there are multiple objectives of a program), the main difference being that the subjective judgments regarding the value of health outcomes are made by techniques like willingness-to-pay (WTP) rather than by utilities (QALYs, HYEs).

Drummond, et al., defined the basics tasks of any economic evaluation as "…. To identify, measure, value and compare the costs and outcomes of the alternatives being considered" (Drummond, 1997).

In recent years, use of cost-effectiveness analysis has been steadily increased and has been used for allocating limited resources in various health care programs (Sloan, 1995)

Health Consequences of Syphilis

Syphilis, a genital ulcerative disease, is highly infectious, but easily curable in its early (primary and secondary) stages. If untreated, it can lead to serious long term complications, including brain, cardiovascular, and organ damage, and even death. Untreated syphilis in pregnant women can also result in congenital syphilis (syphilis among infants), which can cause stillbirth, death soon after birth, and physical deformity and neurological complications in children who survive. (CDC, 2008)

Syphilis, like many other STDs, facilitates the spread of HIV by increasing the likelihood of transmission of the virus. (CDC, 1998)

Partner Notification in Syphilis Control

Peterman et al (1997) states that...."Health care for many sexually transmitted diseases (STDs) should not stop after diagnosis and treatment. Patients with curable infections are at risk of reinfection, but this risk can be reduced by treating their sexual partners. Partners also benefit when their infections are identified and treated or when notification helps them avoid acquiring infection. Other people in the community benefit from partner notification if it reduces the amount of disease in the community."

Cowan FM et al (1996) also states that ..." Partner notification endeavors to reduce the burden of asymptomatic disease in the community and shorten the

average period of infectiousness for a given disease, in the expectation that this will reduce disease transmission within the population"

Some studies in developing countries like sub Saharan Africa also found that targeted STD interventions namely syphilis benefits the populations who are at more risk of contracting the disease. Among the population who are at more risk includes the partners of active cases as well. An intervention trial in Mawanza, Tanzania looked at the effectiveness, impact and cost of syndromic management of sexually transmitted diseases and recommended that in order for adequately reducing STDs, increased partner notification of symptomatic patients and prophylactic treatment of non infected partners is a must. (Mayaud P et al 1998)

Katrin KS et al did a study in Louisiana, USA where descriptive analysis of data obtained from interview records of early syphilis patients during 1993 to 1996 was done to describe and compare outcome measures of partner notification. In this study, 25% early syphilis cases were identified through partner notification (3245 , out of 12927). The authors concluded that partner notification is successful in identifying and treating a large number of infected persons. However, complementary strategies will be needed to eliminate syphilis. (Kohl KS et al 1999)

Studies have argued that partner notification is not an effective method of syphilis control. A study done at public health clinics in Portland and Salem in Oregon in 1998 compared the partner notification effectiveness between gonorrhea and syphilis cases. Findings in that study showed that patients with syphilis had a greater number of sexual encounters with persons who subsequently could not

be identified and thus could not be located, notified of their exposure, and treated. There appeared to be two major reasons why patients with syphilis had a greater number of unlocatable partners than did gonorrhea. First, because syphilis has a longer infectious period than gonorrhea, patients with syphilis are more likely to have a greater number of partners from further in the past partners that are intrinsically more difficult to find. Second, patients with syphilis are more likely to engage in specific behaviors, such as prostitution, drug use and anonymous sex which result in unlocatable partners. Based on the findings the authors suggested that targeting partners with high risk behavior and prevention strategies that supplement partner notification are needed to control syphilis. (Andrus JK et al 1990)

Cowan FM et al (1996) also mentions that ..." It appears that partner notification is a relatively ineffective means of disease control when sex with anonymous partners is common or when there is likely to be considerable delay before contacts can be traced"

Syphilis Case Detection by Selective Screening

Persons with perceived risk of syphilis, contacts to patients or patients with symptoms most likely seek treatment at STD clinics or other provider sites. But there are a good number of cases who doesn't show up voluntarily but can be diagnosed by screening at jails. (Silberstein, et al. 2000).

Silberstein , et al did a study in Nassau county, New York among the inmates admitted between June 1, 1993 to May 31, 1995.

A total of 18,442 inmates were screened, out of which 257 turned out to be confirmed syphilis cases. The study was proven to be highly effective in patient identification and treatment delivery and cost effective as well.

Prophylactic Treatment in Prevention and Control of Syphilis

Studies have shown that partners of infectious syphilis are always at risk of developing syphilis.

A study done at London, United Kingdom in 1982 found that 51% (65 of 127) contacts of primary and secondary syphilis cases developed syphilis.

Among which, 58% contacts of primary syphilis and 46% contacts of secondary syphilis eventually developed syphilis. (Schober PC et al, 1983)

Another study in Chattanooga, Tennessee, reviewed 3383 contacts from 1941 to 1945 and found that 48.5% had had or had acquired syphilis during three month follow up. (Werssowetz AJ, 1948)

A study done by Klingbeil and Clark in 1941 at Nashville, Tennessee, found that of 226 married couples both partners were infected in 57.1% cases. (Klingbeil LJ et al, 1941).

A fourth study done at Dallas, Texas in 1949 reported that 62.1% (100 of 161) subjects exposed to early infectious syphilis were infected. (Alexander LJ et al 1949)

Schroeter AL et al (1971) did a case control study where 127 patients exposed to infectious syphilis were evaluated within a 30 day period. All these patients were treated with 2.4 million units of aqueous penicillin G procaine. After a three month clinical and serologic follow-up, these schedules were found to be 100% effective in aborting incubating syphilis. Of a control group of contacts treated with placebo who were exposed to infectious syphilis within 30 days preceding treatment, 30% developed syphilis. (Schroeter AL et al 1971)

Importance of Syphilis Control and Prevention for the Prevention of HIV and Other Complications

Like many other STDs, syphilis facilitates the sexual transmission of HIV. Control and treatment of syphilis can also reduce HIV incidence. Chesson et al did a study in 1996, where they estimated the annual number and cost of new HIV infections in USA attributable to other sexually transmitted diseases. They used a mathematical model of HIV transmission to estimate the probability that a given STD infection would facilitate HIV transmission from an HIV-infected person to his or her partner and to calculate the number of HIV infections due to these facilitative effects. In that study, out of an estimated 5052 new HIV cases 1002 were attributable to syphilis. Their mathematical model suggested that

syphilis is far more likely than the other STDs (on a per case basis) to facilitate HIV transmission. (Chesson HW et al 2000)

Another study by Chesson HW, et al in 2000 looked at the number and cost of syphilis-attributable HIV cases among African Americans. They used a mathematical model to estimate the number of partnerships consisting of HIV-discordant African-Americans in which infectious syphilis was present and the number of new HIV cases attributable to syphilis in these partnerships. The study found out an estimated 545 new cases of HIV infection among African Americans could be attributed to the facilitative effects of infectious syphilis, at a cost of about $113 million. The authors concluded that syphilis prevention could reduce HIV incidence rates and the disproportionate burden of HIV/AIDS on the African American community, resulting in substantial reductions in future HIV/AIDS medical cost. (Chesson HW, et al 2003)

Primary and Secondary Syphilis Case Detection and Effectiveness of Syphilis Control Program

A successful syphilis intervention strategy must interrupt the chain of transmission. The chain of transmission is not interrupted by finding a person who was last exposed 3 months ago and now has a negative test result. Because most transmission occurs from people who have primary or secondary lesions, there is little transmission-prevention benefit to be gained by identifying

people with a positive syphilis test result who have already passed through the primary and secondary stages. (Peterman et al,1997)

Cost Effectiveness Analysis of Screening and Partner Notification

An extensive literature search identified only two cost effectiveness studies which have addressed the cost-effectiveness of syphilis detection by screening and partner notification. Both studies were done at city or county level.

Study 1*: A Comparison of the case-Finding Effectiveness and Average Costs of Screening and Partner Notification*

Oxman, et al did this study in Multnomah County, Oregon in response to a substantial epidemic of syphilis among heterosexuals. (Study period was between 1989 & 1992).This study examined the contributions of screening and partner notification to overall syphilis case-finding in an epidemic situation. The study was designed as a descriptive study of outcomes in a cohort tested for syphilis through the Multnomah county health department. The findings concluded that testing or screening was more cost -effective than disease intervention specialist activity (partner notification) when measured as cost per new case. Testing and Disease Intervention Specialist activity were comparable in cost when measured in terms of Weighted Disease Intervention Index. About 85% of syphilis infections were identified through screening in this study

This study also suggested that partner notification might be more cost-effective when there is a continuous incoming stream of cases.

Study 2: *Examining the direct costs and effectiveness of syphilis detection by selective screening and partner notification*

This study was done by Reynolds, et al in Houston, Texas by using data from individuals tested for syphilis in Houston, Texas in 1994 and 1995. Their objective was to assess from the perspective of a health department the cost effectiveness of selective screening compared to partner notification in detecting early syphilis. More cases of primary and secondary syphilis were detected through selective screening than partner notification. Selective screening was found to be more cost effective compared to partner notification in this study. On the other hand, partner notification was found to be more cost effective only when the hypothetical impact of prophylactic treatment was considered.

Other Cost Effectiveness Studies related to STD/HIV Control and Prevention

Study 1: An Economic Evaluation of a School-Based Sexually Transmitted Disease Screening Program

This study was done by Wang et al on STD screening program in eight New Orleans public high schools. The study assessed incremental cost-effectiveness

of replacing non-school-based screening with the school based screening program. Cost effectiveness was quantified and measured as cost per case of Pelvic inflammatory disease prevented. Micro costing approach was taken in cost analysis. The findings concluded that school-based Chlamydia screening program was cost-effective and cost-saving and could be cost effective in other settings.

Study 2: Cost-effectiveness of improved treatment services for sexually transmitted diseases in preventing HIV-1 infection in Mwanza Region, Tanzania

Gilson, et al did this study on a community-randomized trial to assess the impact, cost, and cost-effectiveness of averting HIV-1 infection through improved management of STDs by primary health care workers in Tanzania. The total and incremental costs of the intervention were estimated by ingredients approach and used to calculate the total cost per case treated, the incremental cost per HIV-1 infection averted, and the incremental cost per disability-adjusted life year (DALY) saved. The incremental cost effectiveness showed $217.62 per HIV-1 infection averted and $10.33 per DALY saved. The authors concluded that the estimated cost-effectiveness of the intervention ($10 per DALY) compares favorably with that of, for example, childhood immunization programs ($12-17 per DALY)

Study 3: Is antenatal syphilis screening still cost effective in sub-Saharan Africa

Terris-Prestholt F et al did this study in Tanzania to estimate the cost effectiveness of on-site antenatal syphilis screening and treatment. They assessed the economic costs of adding the intervention to routine antenatal care. Cost data was obtained by using ingredient approach. Findings included the cost per DALY saved from all syphilis screening from $3.97 to $18.73. The authors also compared this intervention with other antenatal and child health interventions, specifically the prevention of mother to child transmission of HIV (PMTCT) and found out that syphilis screening was at least as cost effective as PMTCT.

Study 4: Effectiveness, impact and cost of syndromic management of sexually transmitted diseases in Tanzania

Mayaud P et al looked into the impact of syndromic management of STDs on the HIV epidemic in Tanzania in this study. Ingredients approach was used for costing in which estimates of the volume of inputs were multiplied by unit prices. Effectiveness was measured by number of HIV infection averted and DALY saved. Incremental cost effectiveness showed an incremental cost of $ 218 per HIV infection averted and the incremental cost per DALY saved was around $ 9 to $ 10. The author also concluded that the intervention compared very favorably with other health interventions generally regarded as highly cost-effective in low-

income countries, such as tuberculosis chemotherapy ($3 to $ 5/DALY), measles immunization ($15-$19/DALY,maternal and child health(MCH) services ($ 30 to $ 50/DALY)

Study 5: Cost-Effectiveness of a Community-Level HIV Risk Reduction Intervention

Pinkerton SD et al evaluated the cost effectiveness of a community-level HIV prevention intervention that used peer leaders to endorse risk reduction among gay men. The intervention was conducted at two gay bars in Biloxi, Mississippi in 1989.Standard cost-effectiveness and cost utility analysis methods were used and a societal perspective was adopted. A mathematical model of HIV transmission was used to translate reported changes in sexual behavior into an estimate of the number of HIV infections averted. It was found out the intervention cost was $ 17150 or about $65,000 per HIV infection averted. The authors concluded that the cost of HIV prevention was more than offset by savings in averted future medical care costs.

Study 6: The cost-effectiveness of the WINGS intervention: a program to prevent HIV and sexually transmitted diseases among high-risk urban women

Chesson HW et al evaluated the cost-effectiveness of the WINGS project, an intervention to prevent HIV and other sexually transmitted diseases among urban

women at high risk for sexual acquisition of HIV. The authors conducted a retrospective analysis of the intervention's cost and used a simplified model of HIV transmission to estimate the number of HIV infections averted. Cost-effectiveness was examined from the societal perspective, in which relevant costs and benefits were included in the analysis without regard to who might actually pay the costs or receive the benefits. Findings included the cost-effectiveness ratios for the condom use skills component of the intervention were $ 97, 404 per case of HIV averted and $8,674 per QALY saved. The study concluded that the intervention, particularly the two sessions of the intervention which focused on condom use skills, could be cost-effective in preventing HIV among women.

CHAPTER 4

METHODS

Cost effectiveness analysis is a method designed to assess the comparative impacts of expenditures on different health interventions. The analysis involves estimating the cost of achieving a given health care objective and compares the costs of achieving a non monetary objective such as lives saved or cases identified.

Cost effectiveness= $\sum$ Quantity * Price / Effectiveness

In a cost effectiveness analysis, costing can be done in two ways-

- Micro costing or Ingredient approach and
- Macro costing or gross costing.

The ingredient or micro costing approach calculates the cost of any input to a production process as the product of the quantity used and the value (or price) of each unit.

The ingredients approach is useful for many reasons, the most important are that it allows analysts and policy-makers to validate the assumptions used; judge whether the estimates presented can be applied to their settings; and, if necessary, change some of the parameters to replicate the analysis for their settings.

On the other hand, gross costs used in macro costing are aggregated costs obtained from electronic data sets or from medical literature.

Incremental cost effectiveness ratio (ICER) represents the additional cost of one unit of outcome gained (e.g. QALY, DALY saved or infection averted or detected) by a health care intervention or strategy, when compared to the next best alternative, mutually exclusive intervention or strategy.

Incremental cost effectiveness ratio is calculated by dividing the net cost of intervention, by the total number of incremental health outcomes prevented by the intervention.

ICER = (cost of intervention 2 – cost of intervention 1) / (Effectiveness of intervention 2 – Effectiveness of intervention 1)

Methods used in the current study:

In this study micro costing approach was taken to identify all costs. Effectiveness was measured by natural effectiveness which is the number of syphilis cases detected.

Cost effectiveness= $\sum$ Quantity * Price / Effectiveness

'Quantity; is the quantity of inputs used in the process of detecting cases including number of tests done, average time spent by each person in processing tests, test results, contacting patient to notify to return for treatment, travel time and travel mileage

'Price' is the economic value of one unit of inputs including testing cost, average salary of persons involved in case detection and travel mileage cost.

Fixed costs were ignored as the health facilities will remain even if the syphilis control program is eliminated.

Indirect costs were not measured because of the perspective of the study.

Primary measure of the effectiveness was the number of primary and secondary syphilis cases detected.

Other measure of effectiveness includes the number of early latent and maternal syphilis cases detected.

Economic Analysis

The cost-effectiveness analysis has been conducted from the point of view of health care delivery system and assessed the relative costs associated with detection of one early case of syphilis through selective screening alone and selective screening combined with partner notification.

The focus of this study was estimating the difference in the recurring resources used for selective screening alone and selective screening combined with partner notification as provided within Louisiana and the cost per case of syphilis detected by both strategies. The incremental cost effectiveness was also calculated to determine how effective is adding partner notification followed by selective screening.

Since the focus of this study was to estimate the cost in detecting early syphilis cases, so costs that occurred following the detection of cases including treatment

medications and persons responsible for administering medications to the infected persons were not included in this study.

However, the cost of medicine and clinical personnel to administer the medicine was included in case of prophylactic treatment. Because, in order to ensure that a person has been prophylactic ally treated, treatment is mandatory and hence costs involved with that has to be included in the analysis.

Indirect costs were not measured because of the perspective taken. In addition, some costs were also ignored such as fixed costs. For example, capital costs such as clinic space and office equipment will remain a necessary expense even after the elimination of a Syphilis Control Program, as syphilis is one of many STDs for which the STD Control Program expends these resources.

Steps Involved in Syphilis Testing

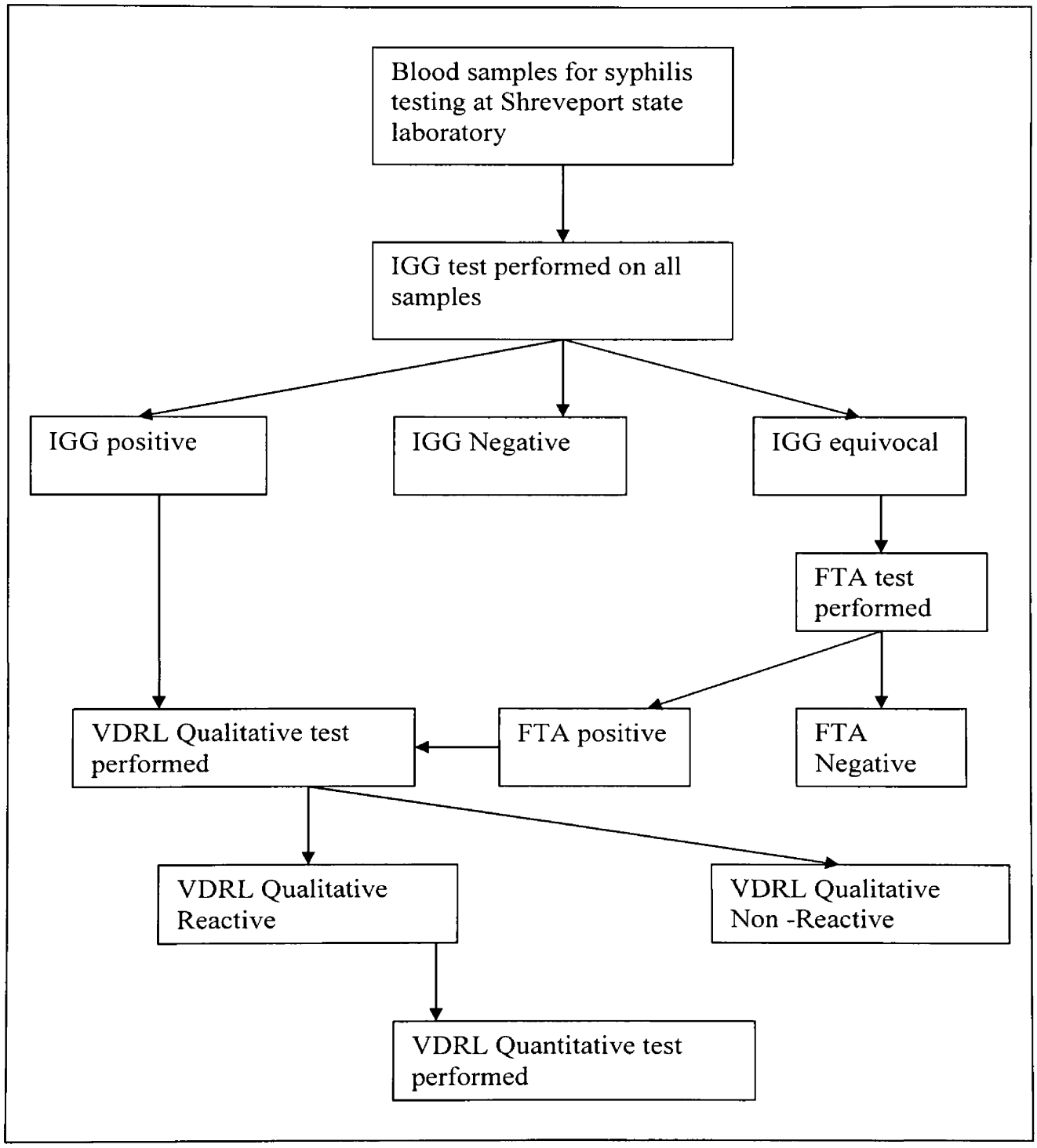
Whenever a patient comes to a clinic for testing, he or she gets registered by the clerical staff. After getting registered, the patient's blood is drawn by the phlebotomist or the nurse depending on the facility.

After the blood has been drawn, then the patient is seen by nurse. Even if a patient comes for syphilis blood test as a volunteer, still he is seen by the nurse. The nurse takes the history of the patient and performs examination and later documents everything in the STD 39A (for males) or STD 39B (for females) form.

Blood samples for syphilis testing from all Louisiana Office of Public Health STD clinics, family planning clinics, and prenatal clinics are sent to the Shreveport State Laboratory, owned and operated by State of Louisiana.
A total of 54657 blood samples were processed for syphilis testing at Shreveport state laboratory in 2007.

Among the blood samples processed in 2007 at the state laboratory, 53818 were part of the selective screening which detected 367 early syphilis cases.
Remaining 839 samples processed as part of partner notification detected additional 276 early syphilis cases.
But the total number of blood samples processed for the remaining 641 early syphilis cases detected at jails, hospitals (private and public) and other private provider sites were unknown. Out of these 641 cases, 638 were detected from selective screening and 3 were from Partner notification. As these cases were included in our study so an assumption was necessary to estimate the number of samples processed to get these cases. We assumed that same proportion of tests was done for the cases detected outside of the state laboratory. By applying the same proportion of number of samples processed at the state laboratory (53818 samples were processed to detect 367 early syphilis cases) we estimated that 93558 samples were processed to detect 641 cases outside of state laboratory.
The following steps are followed in processing blood samples for syphilis testing -

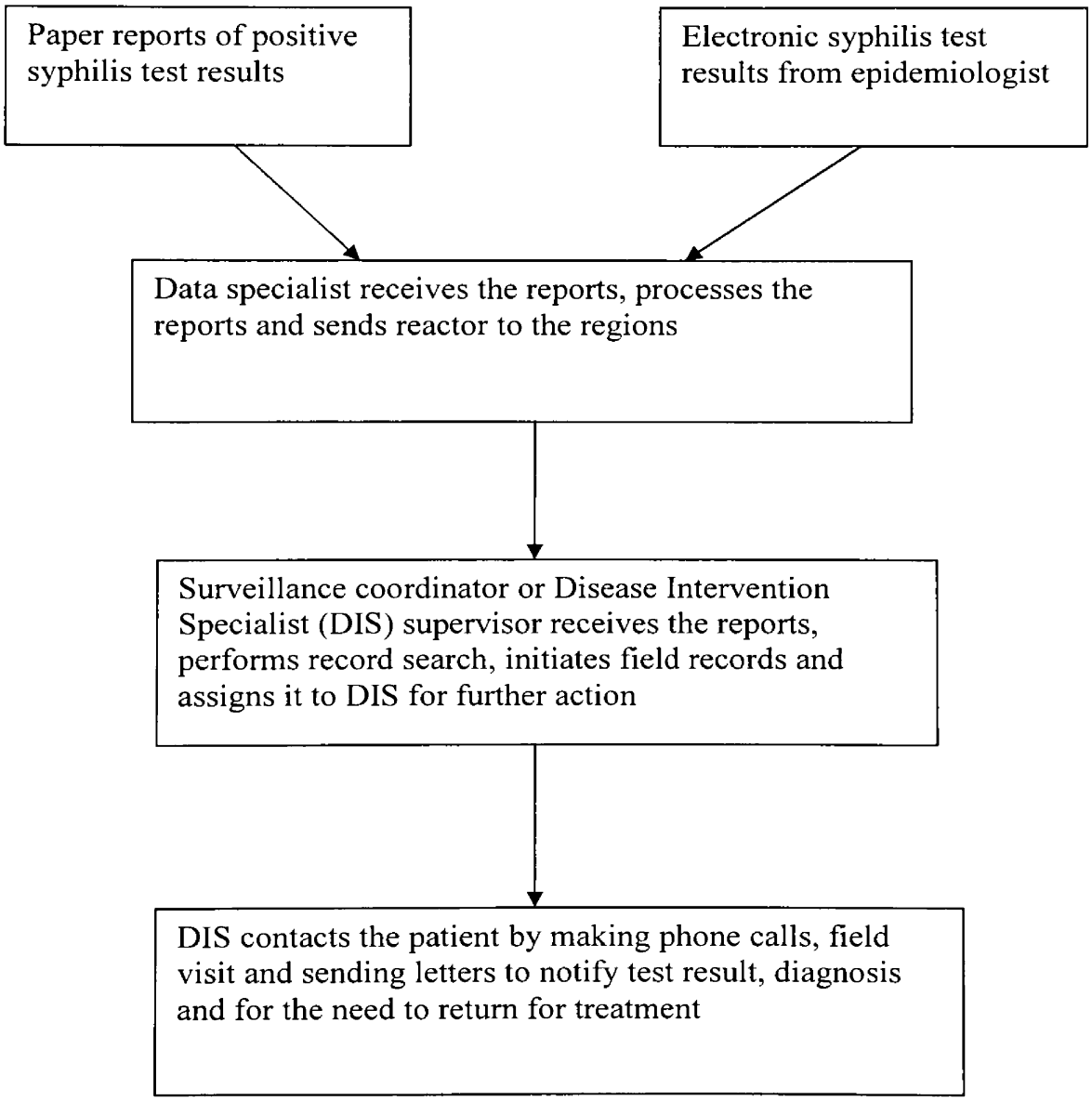
Figure 2: Flow chart showing the steps involved in processing blood samples for syphilis testing in Shreveport state laboratory-



Steps Involved in Positive Syphilis Tests (Reactors) Processing

All positive syphilis test results from Louisiana OPH sites and non OPH sites are sent to the Louisiana STD control program, either as paper reports or as electronic reports. Then the following steps are involved in reactor processing-

Figure 3: Work flow related to positive syphilis tests in Louisiana STD Control Program

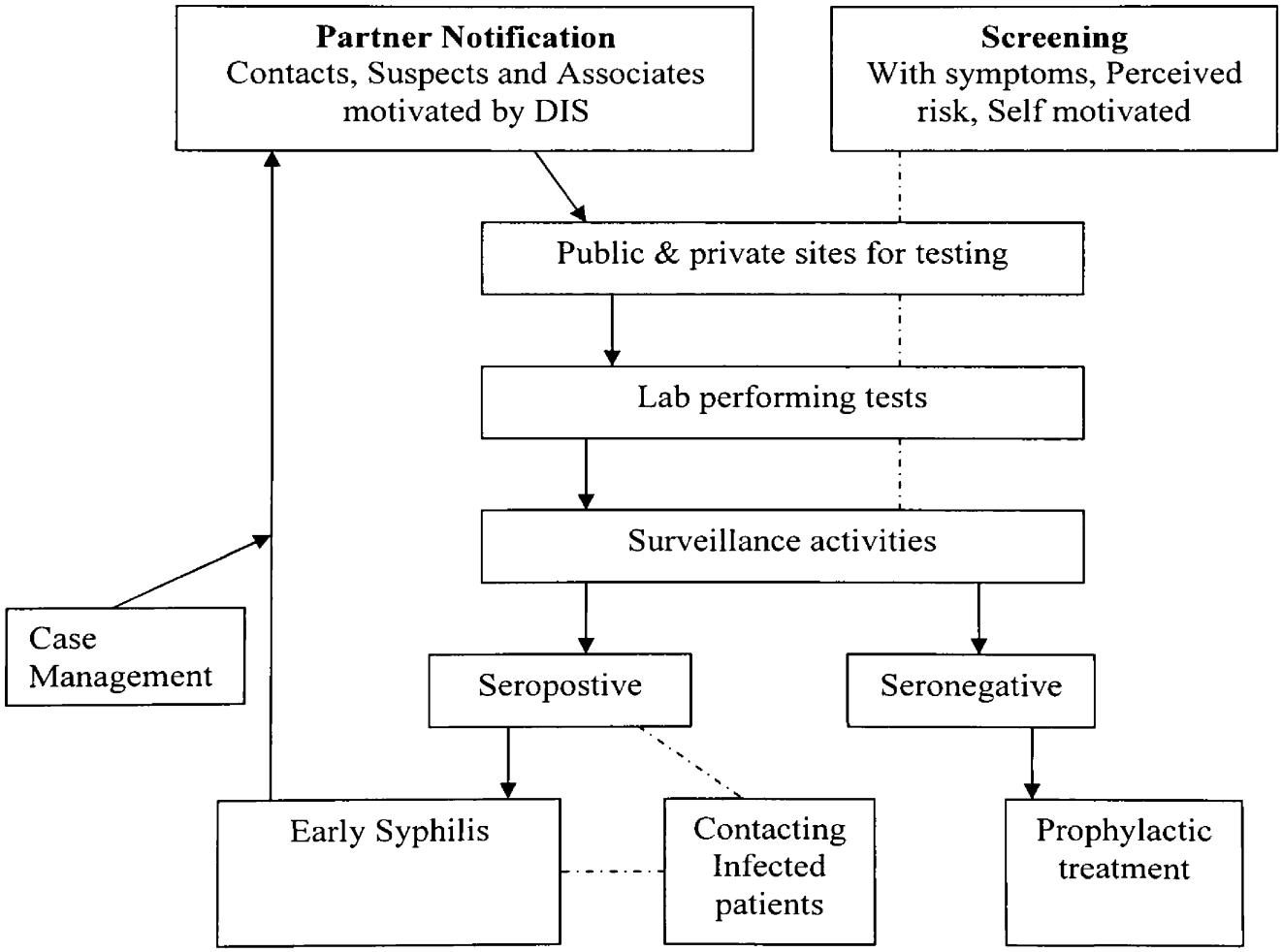


Data specialist receives the paper reports directly from Louisiana OPH and non OPH sites. For the electronic reports, the epidemiologist downloads the data from various systems. Once the electronic data are downloaded, the epidemiologist cleans, formats and sends paper copies to the data specialist. After receiving the reactors, data specialist performs a record search and follows a reactor grid for making decision on the reactors. Most of the dispositions for the reactors are done at the STD central office and the remaining is sent to the regional offices for further action. A total of 9661 positive syphilis tests were processed by the data specialist in 2007. The following table depicts the various dispositions of reactors in Louisiana in 2007 as processed by Louisiana STD control program.

Steps Involved in Syphilis Case Detection

The following figure summarizes various steps involved in syphilis case detection by selective screening and partner notification.

Figure 4: Steps involved in syphilis case detection by partner notification and selective screening and cost associated in each method *



*adapted and partially modified from Reynolds et al

Measuring Effectiveness

The primary measure of effectiveness for this study was the number of primary and secondary syphilis cases detected through selective screening alone and selective screening combined with partner notification.

The reason for putting emphasis on detection of primary and secondary syphilis was because these are the two infectious stages of syphilis where the spread of the disease is most likely to occur and secondary prevention is always most effective when detecting and treating syphilis in its incubating or infectious stages.

Early latent syphilis and maternal syphilis cases were also calculated as measure of effectiveness by method of case detection using both strategies.

Study Population

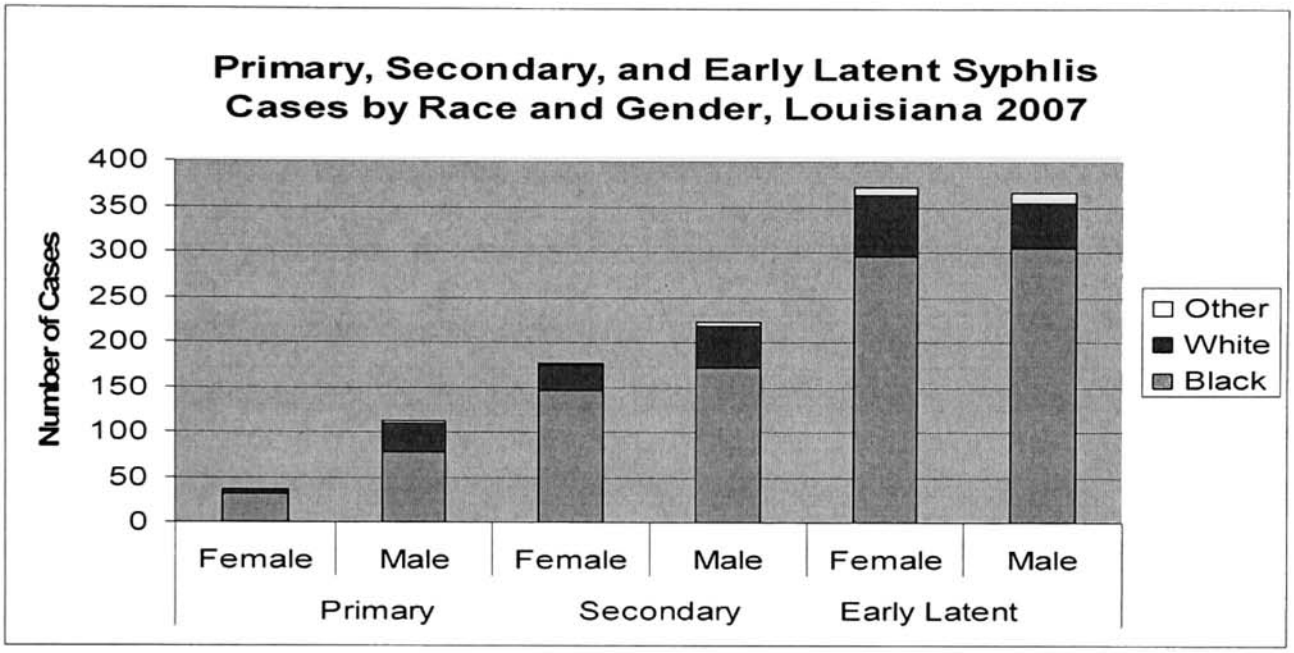
A total of 1284 early syphilis cases were detected in Louisiana in 2007 and forms the sample of this study.

Data for this study was provided by the Louisiana STD Control Program.

Table 1: Race and gender distribution of Early Syphilis cases in Louisiana

Race	Primary		Secondary		Early Latent		Total
	Female	Male	Female	Male	Female	Male	
Black	32	78	146	172	296	305	1029
White	4	31	28	46	66	48	223
Other	0	3	2	5	10	12	32
Total	36	112	176	223	372	365	1284

Fig 5: Racial distribution of syphilis cases in Louisiana, 2007



Racial disparity is widely noted in the study sample with 80% early syphilis cases occurring among the black population.

Table 2: Age distribution of Early Syphilis cases in Louisiana, 2007

Age Group	Primary	Secondary	Early Latent	Total
0-4	0	0	0	0
5-9	0	0	0	0
10-14	0	2	5	7
15-19	23	44	77	144
20-24	26	91	180	297
25-34	41	107	222	370
35-44	25	87	144	256
45-54	26	50	78	154
55-64	6	12	27	45
65-74	1	5	3	9
75 & Above	0	1	1	2
Total	148	399	737	1284

The age distribution of the study sample shows that about 29% syphilis cases occurring in 25 to 34 years age group, followed by 23% in 20 to 24 years and 20% in 35 to 44 years age group.

Among the 1284 early syphilis cases, 1005 were detected by selective screening and remaining 279 were detected by partner notification of the infected cases identified through selective screening.

Each of these 1284 cases documented on an interview record form also known as 73.54 forms was individually reviewed and analyzed to classify the cases having been detected either by selective screening or partner notification.

Individuals, who were symptomatic or asymptomatic, initially tested for syphilis on the basis of risk history at Louisiana Office of Public Health STD clinics, family planning clinics, prenatal clinics, jails or at other private provider facilities were classified as cases detected through selective screening.

Individuals who were initially tested as the result of active case finding operation were classified as cases detected through partner notification.

CHAPTER 5

RESULTS

Measuring Effectiveness of Selective Screening

The primary measure of effectiveness of this study was the number of primary and secondary syphilis cases detected.

117 primary and 318 secondary syphilis cases were detected through selective screening and comprises the measure of effectiveness.

Other measures of effectiveness included early latent and maternal syphilis cases detected. 570 early latent syphilis cases and 70 maternal syphilis cases were detected through selective screening.

Among the maternal syphilis cases detected 6 were primary, 9 secondary and 55 were early latent syphilis.

Measuring Effectiveness of Partner Notification

31 primary, 81 secondary and 167 early latent syphilis cases were detected through partner notification.15 maternal syphilis cases were also detected among which 1 primary, 3 secondary and 11 were early latent cases.

Among the 1284 cases detected in Louisiana in 2007, 643 cases were detected at Louisiana Office of Public Health STD clinics, family planning clinics and prenatal clinics. Remaining 641 cases were detected at jails, hospitals (private and public) and other private provider sites.

Table 3: Early Syphilis case detection by provider type in Louisiana, 2007

Site	Method of case detection	Stage of syphilis	Number of syphilis cases	Total
Louisiana Office of Public Health sites	Selective Screening	Primary	50	367
		Secondary	117	
		Early Latent	200	
	Partner Notification	Primary	31	276
		Secondary	81	
		Early Latent	164	
Non Louisiana Office of Public Health sites	Selective Screening	Primary	67	638
		Secondary	201	
		Early Latent	370	
	Partner Notification	Primary	0	3
		Secondary	0	
		Early Latent	3	
Total				1284

Cases Detected Through Selective Screening

Approximately 78% (n=1005) of all early syphilis (n=1284) were detected through selective screening.

Among the clinics operated by the Louisiana Office of Public Health, STD clinics (stand alone & parish health units) were responsible for detecting about 31.9% (n=321) cases, prenatal clinics 2.3% (n=23), family planning clinics 0.7% (n=7) and other parish health units 1.6% (n=16).

Cases detected by the sites which are not operated by Louisiana Office of Public Health includes Private hospital and doctors 39.7% (n=399), Jails 7.2% (n=72) and Charity hospitals 16.6% (n=167).

The largest proportion of all the early syphilis cases (n=1005) detected through selective screening were cases of early latent syphilis (n=570; 56.7%) followed by secondary syphilis (n=318; 31.7%) and primary syphilis (n=117; 11.6%). 70 cases were detected in pregnant women.

Cases Detected Through Partner Notification

Among all early syphilis cases (n=1284) detected in Louisiana in 2007, a total of 279 (21.7%) cases were detected through partner notification.

276 of these cases were initially tested at Louisiana Office of Public Health STD clinics or parish health units and the remaining 3 were tested at private provider sites.

Serology cost adjustments were made for these 3 cases.

Out of these 279 cases, early latent syphilis has the highest incidence (n= 167; 59.8%), followed by secondary syphilis (n=81; 29.1%) and primary syphilis (n=31; 11.1%).

The distribution of syphilis cases by stage was similar to that for cases detected through selective screening.

Measuring Cost

Measuring cost of Selective Screening

The cost of selective screening includes the cost of testing and contacting the infected patients to notify them about their test results, diagnosis and the need to return for treatment, if not treated based on syndromic assessments while being tested for syphilis.

A total of 54657 IGG tests were done at Shreveport state laboratory, out of which 839 had received a syphilis test done as part of partner notification. So a total of 53818 IGG tests were done for selective screening at Louisiana Office of Public health operated clinics. Based on the IGG test results 3158 VDRL qualitative and 1717 VDRL quantitative tests were also done. 75 FTA tests were done for tests having equivocal IGG test results .RPR tests were done for 94 persons at Delgado STD clinic in New Orleans and Baton Rouge STD clinic.

For the non Louisiana Office of Public health sites which includes hospitals (private and charity), private doctors and jails, an estimated 93558 IGG tests were done for the purpose of selective screening. An estimated 5490 VDRL qualitative and 2985 VDRL quantitative tests were also done. An estimated 163 RPR test were also done.

Measuring cost of Partner notification

The cost associated with partner notification includes the cost of case management, cost of serology of sexual contacts of syphilis cases, cost of prophylactic treatment and cost of case detection at private provider sites.

As mentioned earlier, all early syphilis cases are documented in an interview record form irrespective of whether an actual interview took place or not. Out of the 1284 early syphilis cases detected in 2007, 1231 interview records were sent to the STD central office. Among these 1231 cases having interview records, 54 refused interview and 64 were unable to locate. So a total of 1113 cases were interviewed and actually went through the complete case management process. A contact index of 1.35 was achieved by getting 1505 contacts from 1113 cases interviewed. Dispositions of these 1505 contacts are as follows-

Table 4: Disposition of partner of Syphilis cases in Louisiana, 2007

Type of Disposition	Total Number	Percentage
A-Preventive Treatment	378	25.1%
B-Refused Preventive Treatment	0	0.0%
C-Infected, Brought to Treatment	279	18.5%
D-Infected, Not Treated	8	0.5%
E-Previously Treated for This Infection	334	22.2%
F-Not Infected	82	5.4%
G-Insufficient Information to Begin Investigation	40	2.7%
H-Unable to Locate	193	12.8%
J-Located, Refused Examination	115	7.6%
K-Out of Jurisdiction	34	2.3%
L-Other	11	0.7%
Missing	31	2.1%

Table 5: Disposition of partner of Syphilis cases by region in Louisiana, 2007

Disposition	Public Health Regions of Louisiana								
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
A	67	98	15	49	10	26	30	63	22
B	0	0	0	0	0	0	0	0	0
C	40	55	5	72	7	14	18	36	32
D	0	0	0	7	0	0	0	0	1
E	44	41	7	139	6	14	12	38	32
F	14	23	7	12	2	10	1	5	8
G	0	0	0	17	0	3	5	1	14
H	31	68	2	39	2	4	19	9	20
J	22	28	4	22	1	3	12	6	17
K	0	1	7	12	0	1	0	0	13
L	4	5	0	2	0	0	0	0	0
Missing	1	8	2	14	0	0	1	1	2
Total	223	327	49	385	28	75	98	159	161

The total number of persons who received services as part of partner notification includes, persons with syphilis being case managed by Disease Intervention Specialists (n=1113), persons who were identified as sexual contacts of syphilis cases and were under Disease Intervention Specialist (DIS) surveillance (n=1505), sexual contacts of syphilis cases who received serologic testing for syphilis (n=839) and sexual contacts receiving prophylactic treatment (n=378).

Cost Analysis

In order for doing the cost analysis, it was necessary to properly understand the work flow regarding syphilis detection so that cost analysis can be done accurately.

Persons involved in every steps of case detection (except lab personnel) were interviewed by telephone about time required to complete each step. Personnel who were interviewed for time assessments include clerical personnel (n=18, 2 from each region), phlebotomist (n=18, 2 from each region), nurse (n=18, 2 from each region), Disease Intervention Specialist (n=18, 2 from each region), DIS supervisor (n=9, 1 from each region), data specialist at the central office (n=1) and epidemiologist at the central office (n=1).

Though the phlebotomists should be the person responsible for drawing blood from patients, but in the Louisiana Office of Public Health sites, nurses are responsible for drawing blood in all sites except two, which includes Delgado STD clinic in New Orleans and Baton Rouge STD clinic. There are no phlebotomist position in any LAOPH sites other than the two mentioned earlier. So for the time estimate for drawing blood was obtained from those two phlebotomists and additional sixteen nurses who are drawing bloods.

Clerical personnel were interviewed for average time required for patient registration procedures, phlebotomists for drawing blood, nurse for history taking and examining patients, DIS for reactor processing, case management and contacting patients, DIS supervisor for supervisory activities related to reactor

processing and case management, data specialist for reactor processing at central office and epidemiologist for processing electronic lab reports.

The time required to complete paperwork associated with responsibilities of all the above mentioned personnel were also estimated from the interview. Average of the time estimates was used for cost analysis.

Testing cost was determined as paid to Shreveport state laboratory. The state laboratory charges for each test based on work time units. Cost per test is as follows-

Table 6: Cost of syphilis test

Test	Work time unit required	Cost per work time unit	Cost per test
IGG	2.0	$7.95	$15.9
FTA	6.5	$7.95	$51.67
VDRL Qualitative	1.4	$7.95	$11.13
VDRL Quantitative	2.5	$7.95	$19.87

Table 7: Average hourly salary (2009 Louisiana civil service pay scale) including 28% fringe benefits for all personnel related to Syphilis case detection

Job title	Hourly salary
Clerical staff	17.95
Phlebotomist	32.79
Nurse	41.97
Data specialist	17.95
Epidemiologist	31.78
Surveillance coordinator	32.27
Disease Intervention Specialist (DIS)	28.59
Disease Intervention Specialist Supervisor	39.77

Table 8: Disposition of positive syphilis tests (reactors) in 2007

Disposition	Frequency	Percent
Syphilis, Administrative Closure	300	3.1
Syphilis, Epi Treated	146	1.5
Serofast	359	3.7
Syphilis, Previously Treated	4272	44.2
Infected, Not Treated	34	0 .4
Syphilis, Physician Refused To Cooperate	7	0 .1
Syphilis, Unable To Locate	152	1.6
Syphilis, Located, Refused Treatment	39	0.4
Syphilis, Deceased	8	0.1
Syphilis, Interstate Investigation (OOJ)	34	0.4
Out of Jurisdiction, Intrastate (OOJ)	2	0.0
Syphilis, Follow-Up Serology	900	9.3
Syphilis, Letter Sent	1080	11.2
Syphilis, Treated No Diagnosis	112	1.2
Syphilis, Reactor Pending Disposition	151	1.6
Syphilis, Admin.Closure(State Program)	57	0.6
Syphilis, Admin.Closure-Tx't Per PMD-Undocumented	45	0.5
Syphilis, False Positive (Biological)	26	0.3
Syphilis, Neurosyphilis	6	0.1
Syphilis,Reactor/BabyNot Infected(Cord blood)	49	0.5
Syphilis, Reactor/Baby Epi Treated	26	0.3
Syphilis Reactor	18	0.2
Syphilis, Primary (Lesion Present)	146	1.5
Syphilis, Secondary (Rash or other symptoms)	399	4.1
Syphilis, Early Latent (Less than 1 year duration)	709	7.3
Syphilis, Late Latent (Over 1 year)	513	5.3
Syphilis, Cardiovascular/Neurosyphilis	17	0.2
Syphilis, Congenital-Confirmed	2	0.0
Syphilis, Congenital-Presumptive	36	0.4
Syphilis, Unknown Latency	14	0.1
Syphilis, Late w/clinical manifestations	1	0.0
TOTAL	9661	100.0

Among the 9661 positive syphilis tests (reactors) processed in 2007, 8714 were related to selective screening and the remaining 950 were related to partner notification.

Once the reactors are sent to the surveillance coordinator or DIS supervisor (depending on who is responsible for receiving reactors in different regions) at the public health regions, they will perform additional record search, disposition the reactors and send it back to the STD central office. A total of 3218 reactors were sent to the regional offices in 2007, which were part of selective screening and 950 reactors were sent for partner notification.

These reactors then result in getting initiated as field records which are assigned to DIS for further evaluation and action by the DIS supervisor. 1776 field record was assigned to DIS with an average of 9.31 minutes required per field record.

After the DIS receives the field records from the supervisor, he or she will start contacting the patients by making phone calls, field visits and sending letters to notify test result, diagnosis and for the need to return for treatment.

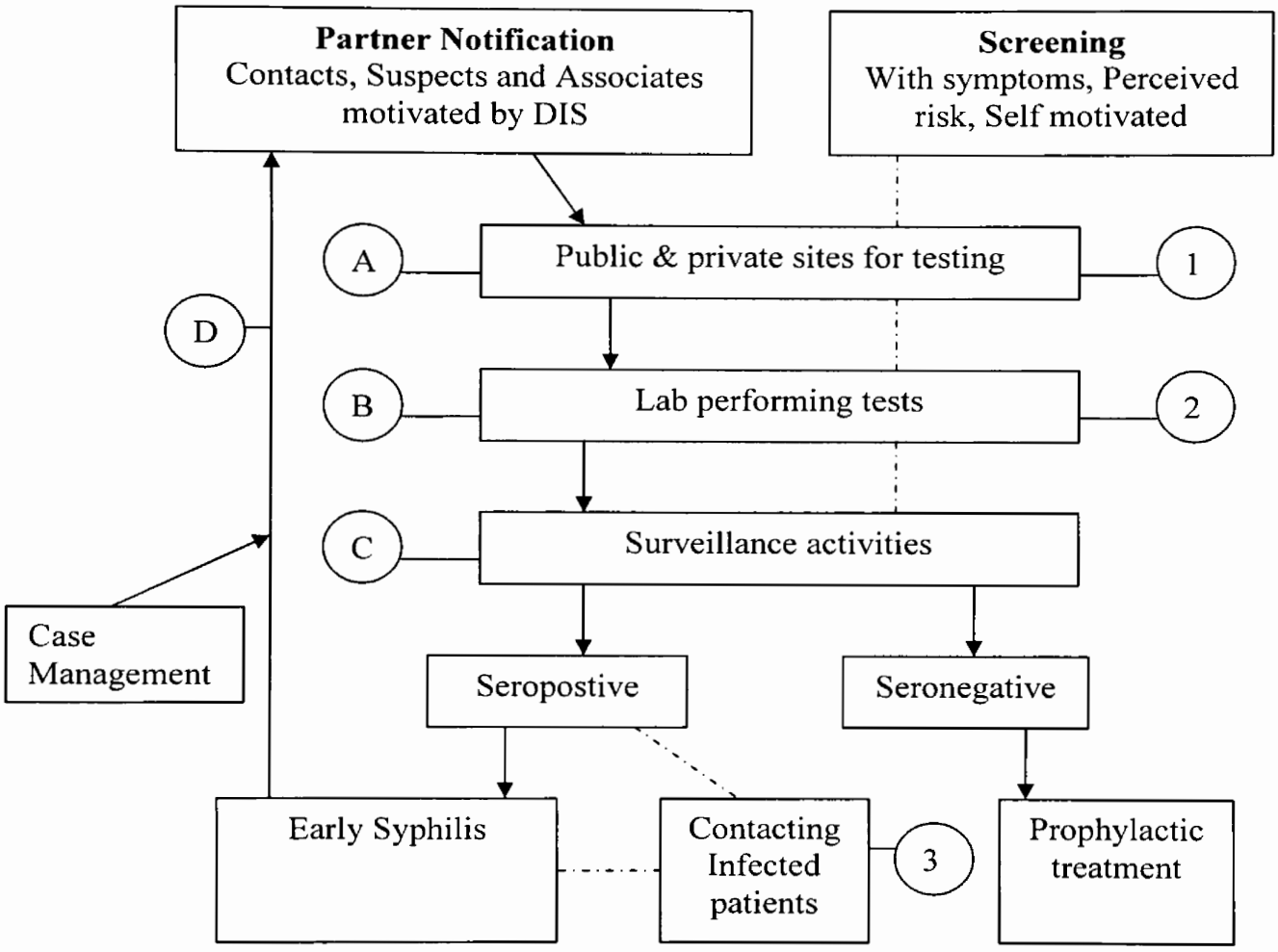
Table 9: Cost analysis of STD personnel prior to assigning field record to Disease Intervention Specialist (DIS)

STD personnel	Average time spent (mins)	Total time spent (hours)	Hourly salary ($)	Total cost ($)
Clerk (147376)*	10	24562.67	17.95	440900
Phlebotomist (147376)*	9.17	22523.97	32.79	738561
Nurse (14736)*	23.61	57992.46	41.97	2433943
Data specialist (8714)*	15	2178.5	17.95	43354
Epidemiologist (3959)*	1.5	98.98	31.78	3145
Surveillance Coordinator (3218)*	27	1449.71	32.27	46780
DIS supervisor (1776)*	9.31	275.58	39.77	10960

* Denotes number of patients, positive lab tests (reactors) or field records worked by STD personnel

The following figure depicts various item costs related to selective screening and partner notification. All the wages for personnel involved in different steps are based on the State of Louisiana 2009 pay scale and include a 28% adjustment for fringe benefits. Averages for all individuals who are working currently in the designated role were used as wage estimates for cost analysis.

Figure 6: Steps involved in syphilis case detection by partner notification and selective screening and cost associated in each method *



Partner notification : A- cost of personnel for phlebotomy i.e. Nurse, clerks and supplies related to drawing of blood, B- cost of work time unit for tests performed, C-Personnel for surveillance activities (DIS), D-cost of personnel for case management (DIS and Supervisor) including travel

Selective screening: 1-Personnel for phlebotomy, clerical work and supplies related to task, 2- cost of work time unit for tests performed, 3- Personnel to contact infected patients (DIS).Phone call, and letter or field visit related supplies and travel cost.

* adapted and partially modified from Reynolds et al

Persons involved in every steps of case detection (except lab personnel) were interviewed by telephone about time required to complete each step. Personnel who were interviewed for time assessments include clerical personnel (n=18, 2 from each region), phlebotomist (n=18, 2 from each region), nurse (n=18, 2 from each region), Disease Intervention Specialist (n=18, 2 from each region), DIS supervisor (n=9, 1 from each region), data specialist at the central office (n=1) and epidemiologist at the central office (n=1).

Though the phlebotomists should be the person responsible for drawing blood from patients, but in the Louisiana Office of Public Health sites, nurses are responsible for drawing blood in all sites except two, which includes Delgado STD clinic in New Orleans and Baton Rouge STD clinic. There are no phlebotomist position in any LAOPH sites other than the two mentioned earlier. So for the time estimate for drawing blood was obtained from those two phlebotomists and additional sixteen nurses who are drawing bloods.

Clerical personnel were interviewed for average time required for patient registration procedures, phlebotomists for drawing blood, nurse for history taking and examining patients, DIS for reactor processing, case management and contacting patients, DIS supervisor for supervisory activities related to reactor processing and case management, data specialist for reactor processing at central office and epidemiologist for processing electronic lab reports.

Cost Analysis of Selective Screening

The total direct cost of selective screening is estimated by adding the cost of all persons screened and the cost of contacting those infected to notify them of the result, diagnosis and the need for return for treatment. Testing costs are derived by multiplying the number of persons screened at Louisiana Office of Public Health STD clinics, family planning clinics, prenatal clinics, hospitals, jails and other private provider sites.

Table 10: Testing cost for Selective screening in Louisiana, 2007

Louisiana OPH sites			
Test	Number	Cost / Test	Total Cost ($)
IGG	53818	15.9	855706.2
VDRL Qualitative	3158	11.13	35148.54
VDRL Quantitative	1717	19.87	34116.79
FTA	75	51.67	3875.25
RPR	94	4.1	385.4
Total			929232.18
Non Louisiana OPH sites			
Test	Number	Cost / Test	Total Cost
IGG	93558	15.9	1487572.2
VDRL Qualitative	5490	11.13	61103.7
VDRL Quantitative	2985	19.87	59311.95
RPR	163	4.1	668.3
Total			1608656.15
Total Cost of testing for Selective Screening			2537888.33

The cost of contacting infected patients were derived by sampling field records to determine the average number of phone calls made, letters sent and field visits done. Disease intervention specialists document every step related to the field record on the back of the field record including date and time of phone calls, field visit or letter left at patient's address.20% field records were randomly sampled to estimate the average number of phone calls made, letters sent and field visits done .Time estimation was done for every related step from the interviews of the staffs responsible for the tasks.

The cost of travel for field visits were obtained from the travel bills paid to the DIS at every region from January to June of 2009. As the syphilis morbidity for previous years showed that morbidity remains pretty much similar between first and second half of the year so an assumption was made that it would remain similar for 2009 as well. Data up to November 2009 supports this assumption. Based on this assumption, further assumption was made that traveling would also remain same between the two halves of the year. So by doubling the travel bill for first half of 2009 we estimated the total travel bill for 2009. Travel time per field record was estimated from the interview of the DIS.

Since each administrative public health regions in Louisiana are geographically different, the travel times vary between regions. As the travel bills were combined for selective screening and partner notification, it was difficult to determine the amount spent for selective screening and partner notification. This issue was

dealt with by proportionally allocating travel bills based on the field records requiring field visits in each region.

A total of 1827 field records of selective screening required phone calls for contacting the patient. The sampled field records showed that average 2.43 phone calls were made per field record. Based on the current market price, $0.25 per phone call was used to determine the cost of phone call. Cost of all the phone calls was $1110.

From the interview of the DIS, it was found that an average 9.79 minutes were spent with the patient at each phone call which gave a cost of $5178 for time spent on these phone calls.

Table 11: Cost analysis of contacting patient by phone by DIS

Field record required phone call	Phone call per field record	Total call	Cost of phone call ($)	Average time spent per phone call (mins)	Cost of time spent on phone ($)
1827	2.43	4439.61	1109.90	9.79	5177.62

Table 12: Cost analysis of travel time per field record to contact patient by DIS

Region	Field Record (FR)	Average field visit(FV) per field record	Average Travel time for FV per FR (in minutes)	Total travel time (in hours)	Cost
Region 1	576	0.71	30	204.48	5846
Region 2	477	0.71	45	254.00	7262
Region 3	48	0.71	35	19.88	568
Region 4	216	0.71	60	153.36	4385
Region 5	73	0.71	45	38.87	1111
Region 6	55	0.71	65	42.30	1209
Region 7	131	0.71	45	69.76	1994
Region 8	88	0.71	63	65.92	1885
Region 9	112	0.71	80	106.03	3031
TOTAL	1776	0.71	52	1093.53	31264

On an average 0.71 field visit was required to contact a patient at the patient's address. Travel times to contact patient were least in region 1, which is the greater New Orleans area (average 30 minutes per field record) and highest in region 9 which is greater Covington area (average 80 minutes per field record). Total cost for travel time to contact the patient for the whole state was $31624. In many instances, if the patient was not available at the address because of work schedule or something else, DIS leaves a letter at the patient's address to contact later. Average 0.41 letters are left per field record. Now, as this 0.41 letter per field record requires a field visit as well so travel time needs to be calculated for this step as well.

Table 13: Cost analysis of travel time per field record to leave letter at patient's address by DIS

Region	Field Record (FR)	Average field visit(FV) per field record to leave letter	Average travel time for FV per FR (in minutes)	Total travel time (in hours)	Cost ($)
Region 1	576	0.41	30	118.08	3375.91
Region 2	477	0.41	45	146.68	4193.51
Region 3	48	0.41	35	11.48	328.21
Region 4	216	0.41	60	88.56	2531.93
Region 5	73	0.41	45	22.45	641.77
Region 6	55	0.41	65	24.43	698.43
Region 7	131	0.41	45	40.28	1151.68
Region 8	88	0.41	63	38.06	1088.26
Region 9	112	0.41	80	61.23	1750.47
TOTAL	1776	0.41	52	631.48	18055

Once the DIS arrives at the patient's address, he or she spent some time with the patient in notifying test result, diagnosis or the need for treatment. The estimated average for the time spent with the patient is 12.18 minutes. Cost was calculated for this as well.

Table 14: Cost analysis of time spent at patient's address during field visit

Region	Field Record (FR)	Field visit (FV) per FR	Average Time spent at Field Visit with patient (minutes)	Total Time spent (hours)	Cost *
Region 1	576	0.71	12.18	83.02	2373.51
Region 2	477	0.71	12.18	68.75	1965.56
Region 3	48	0.71	12.18	6.92	197.79
Region 4	216	0.71	12.18	31.13	890.07
Region 5	73	0.71	12.18	10.52	300.81
Region 6	55	0.71	12.18	7.93	226.64
Region 7	131	0.71	12.18	18.88	539.81
Region 8	88	0.71	12.18	12.68	362.62
Region 9	112	0.71	12.18	16.14	461.52
TOTAL	1776	0.71	12.18	255.97	7319

* obtained by multiplying with average hourly DIS salary of $28.59

As mentioned earlier, if a patient was not available at his address, DIS will leave a letter at that address instructing the patient to contact the DIS. The average time estimate for leaving a letter is 5.03 minutes. Also, an average 0.41 field visit was done to leave a letter. Cost was calculated for time spent in leaving letter as well.

Table 15: Cost analysis of time spent for leaving letters during field visit

Region	Field Record	Average letter left at patient's address per field record	Average time spent for leaving letter (minutes)	Total time spent for leaving letter (hours)	Cost * ($)
Region 1	576	0.41	5.03	19.80	566.03
Region 2	477	0.41	5.03	16.40	468.74
Region 3	48	0.41	5.03	1.65	47.17
Region 4	216	0.41	5.03	7.42	212.26
Region 5	73	0.41	5.03	2.51	71.74
Region 6	55	0.41	5.03	1.89	54.05
Region 7	131	0.41	5.03	4.50	128.73
Region 8	88	0.41	5.03	3.02	86.48
Region 9	112	0.41	5.03	3.85	110.06
TOTAL	1776	0.41	5.03	61.04	1745

* obtained by multiplying with average hourly DIS salary of $28.59

Next step was to calculate the travel mileage cost. Since only region specific travel mileage cost was available which included travel mileage for both selective screening and partner notification, there was no specific way to find out the actual cost related to both methods of case detection separately. In order to deal with this issue, proportional allocation of total travel mileage cost by field records in each region was done and the travel mileage cost for selective screening was estimated.

The estimated travel mileage cost for selective screening was $36533.

Table 16: Travel mileage cost for selective screening

Region	Field record (FR)related to selective screening	Total FR with field visit (including field record of partner notification)	Total Travel mileage cost ($)	Travel mileage cost for selective screening field records ($)
Region 1	576	800	4437.76	3195.19
Region 2	477	805	11756.92	6966.52
Region 3	48	90	3046.16	1624.62
Region 4	216	575	11473.63	4310.09
Region 5	73	101	5914.64	4274.94
Region 6	55	126	3982.8	1738.52
Region 7	131	224	3582.44	2095.09
Region 8	88	246	15347.07	5490.01
Region 9	112	247	6347.75	2878.33
Total	1776	3204	65889.17	36522.84

Total cost of selective screening was calculated by adding all costs in every steps of selective screening. The estimated total direct cost for selective screening for the detection of early syphilis was $6356724.

Table 17: Cost analysis of selective screening

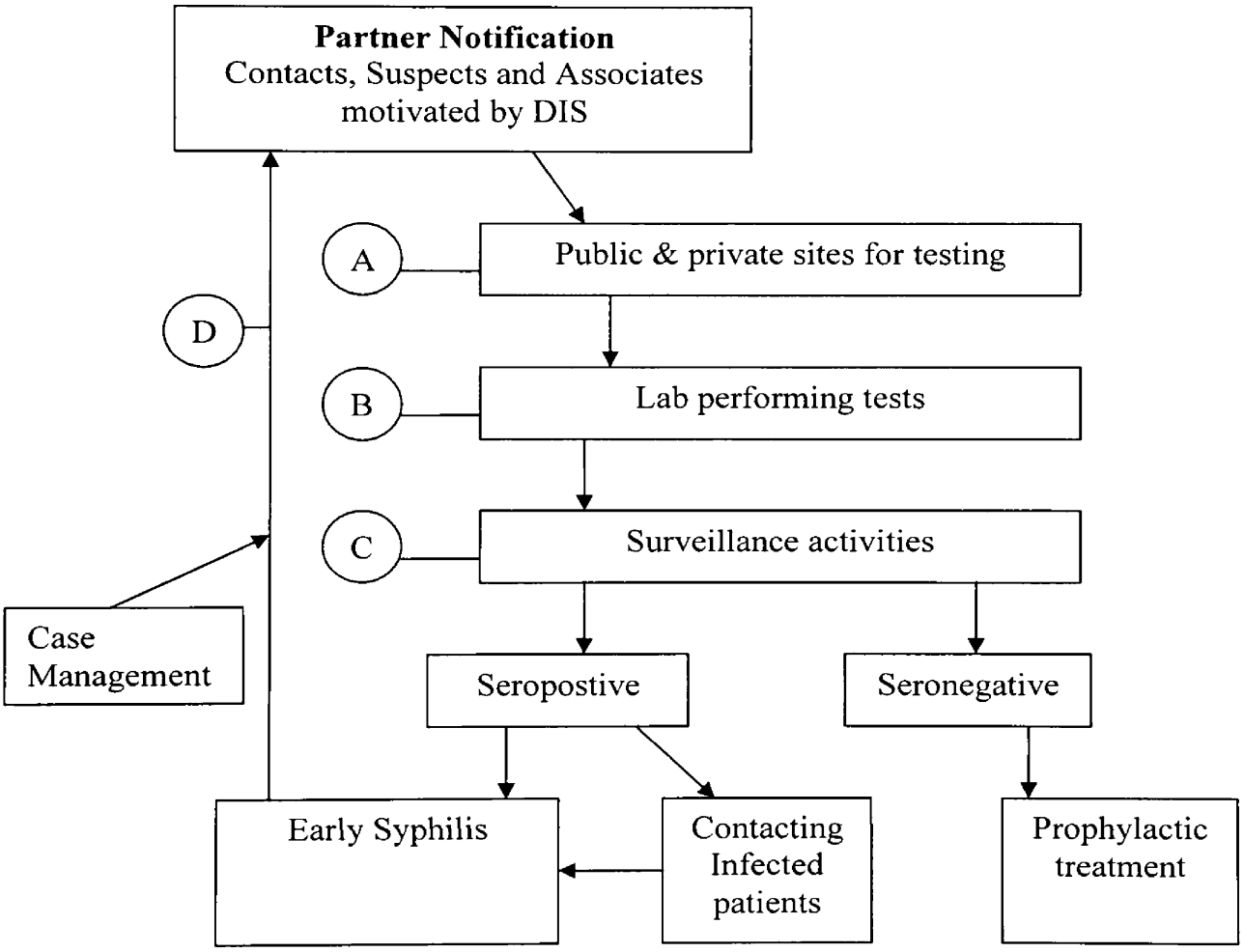
Steps involved	Cost ($)
Clerical Cost for Patient Registration	440899.87
Phlebotomist cost	738560.82
Nurse visit cost	2433943.38
Testing cost	2537888.33
Data specialist cost	43353.74
Epidemiologist costs for ELR data	3145.43
Reactor received & Record Searched at regions	46780.37
Phone call	1109.9
Time spent for phone call	5177.62
Assigning FR to DIS	10959.66
Time spent at patient's address and leaving letter	9063.57
Travel time *	49318.01
Travel mileage	36522.84
TOTAL Selective Screening Cost	63567234

* includes travel time to contact patient at patient's address or to leave a letter

Cost Analysis of Partner Notification

The total cost of partner notification was derived by combining costs associated with serology, surveillance, case management and travel.

The steps involved in partner notification are as follows-



Partner notification :A- cost of personnel for phlebotomy i.e. Nurse, clerks and supplies related to drawing of blood, B- cost of work time unit for tests performed, C-Personnel for surveillance activities (DIS), D-cost of personnel for case management (DIS and Supervisor) including travel (*modified from Reynolds et al)

Out of the 1231 interview records received at STD central office, 1131 were interviewed and 1505 contacts were initiated. These 1505 contacts were under surveillance.

Once a DIS gets a person in for interview, the following steps were followed as recommended by CDC. The steps followed are-

- Pre-interview analysis- which is actually done during the record search of the field record while the case was tested initially
- Original interview -which is the actual interview to get information on contacts, high risk behaviors
- Post interview analysis- done after the original interview and includes visual case analysis (VCA), completing the interview record form and writing a case narrative.
- Referral of sex partners- Field records are initiated on the contacts at this stage
- Re interview - This is a second interview, if the DIS founds out that some information was missing during original interview or visual case analysis points out to something else about exposure or infectivity of the patient or to initiate more contacts. About 50% of syphilis cases in Louisiana had a re interview done in 2007.
- Case closure - Once every step is complete related to the original patient, partner (contacts) dispositions are also available; the case is ready to be closed and sent to the supervisor.

During the case management of every syphilis case, disease intervention specialists are given instructions and feed back by the supervisor. Costs were calculated for the time spent by the supervisor as well.

Table 18: Cost analysis of case management by DIS & DIS supervisor

Steps	Number of cases/reactors/contacts	Time per case (minutes)	Total time (hours)	Cost ($)
Disease Intervention Specialist (DIS)				
Original Interview	1113	39.71	736.62	21059.98
Post Interview Analysis (Case write up, VCA, Case Narrative)	1113	35.88	665.57	19028.76
Referral of Sex partners (including writing up FR)	1505	10	250.83	7171.33
Record Search on Contacts	1505	27.03	678.00	19384.09
Re interview	545	19	172.58	4934.16
Case write up and Narrative for Refused to Interview & Unable to Locate Cases	118	20.05	39.43	1127.35
Case closure	1231	15	307.75	8798.57
Communication with supervisor	1231	21.96	450.55	12881.11
Total				94385.35
Disease Intervention Specialist (DIS) supervisor				
Case review	1231	38.93	798.71	31764.85
Case closure	1231	3.29	67.50	2684.47
Total				34449.32

Costs were calculated for time spent by clerical staff, data specialist, nurse, epidemiologist, disease intervention specialist and disease intervention specialist supervisor. Phone call cost and travel cost including travel time cost were also calculated to estimate the total cost of partner notification.

Table 19: Cost analysis of contacting partners by phone by DIS

Field record required phone call	Phone call per field record	Total call	Cost of phone call ($)	Average time spent per phone call (minutes)	Cost of time spent on phone ($)
1505	2.57	3867.85	966.96	9.79	4510.82

Average 2.57 phone calls were made by DIS to contact partners and an average 9.79 minutes were spent with the partners if they were contacted. Cost was obtained for these steps including each phone call cost at $0.25.

Table 20: Cost analysis of travel time of DIS to contact partner at partner's address

Region	Field Record (FR)	Average Field visit (FV) per FR	Average Travel time for FV per FR (minutes)	Total travel time (hours)	Cost ($)
Region 1	224	0.97	30	108.64	3106
Region 2	328	0.97	45	238.62	6822
Region 3	42	0.97	35	23.77	679
Region 4	359	0.97	60	348.23	9956
Region 5	28	0.97	45	20.37	582
Region 6	71	0.97	65	74.61	2133
Region 7	93	0.97	45	67.66	1934
Region 8	158	0.97	63	161.69	4623
Region 9	135	0.97	80	174.60	4992
Total	1438	0.97	52	1209.65	34584

Table 21: Cost analysis of travel time of DIS to leave letter at partner's address

Region	Field Record (FR)	Average field visit(FV) per FR to leave letter	Average Travel time for FV per FR (minutes)	Total travel time (hours)	Cost ($)
Region 1	224	0.5	30	56.00	1601
Region 2	328	0.5	45	123.00	3517
Region 3	42	0.5	35	12.25	350
Region 4	359	0.5	60	179.50	5132
Region 5	28	0.5	45	10.50	300
Region 6	71	0.5	65	38.46	1100
Region 7	93	0.5	45	34.88	997
Region 8	158	0.5	63	83.35	2383
Region 9	135	0.5	80	90.00	2573
TOTAL	1438	0.5	52	623.53	17827

Table 22: Cost analysis of time spent with partner by DIS at partner's address

Region	Field Record (FR)	Field visit (FV) per FR	Average time spent at Field Visit with patient (minutes)	Total Time spent (hours)	Cost ($)
Region 1	224	0.97	12.18	44.11	1261
Region 2	328	0.97	12.18	64.59	1847
Region 3	42	0.97	12.18	8.27	236
Region 4	359	0.97	12.18	70.69	2021
Region 5	28	0.97	12.18	5.51	158
Region 6	71	0.97	12.18	13.98	400
Region 7	93	0.97	12.18	18.31	524
Region 8	158	0.97	12.18	31.11	889
Region 9	135	0.97	12.18	26.58	760
TOTAL	1438	0.97	12.18	283.16	8095

Table 23: Cost analysis of time spent by DIS for leaving letter at partner's address

Region	Field Record (FR)	Field visit (FV) per FR	Average time spent for leaving letter (minutes)	Total Time spent (hours)	Cost ($)
Region 1	224	0.5	5.03	9.39	268
Region 2	328	0.5	5.03	13.75	393
Region 3	42	0.5	5.03	1.76	50
Region 4	359	0.5	5.03	15.05	430
Region 5	28	0.5	5.03	1.17	34
Region 6	71	0.5	5.03	2.98	85
Region 7	93	0.5	5.03	3.90	111
Region 8	158	0.5	5.03	6.62	189
Region 9	135	0.5	5.03	5.66	162
TOTAL	1438	0.5	5.03	60.28	1723

Table 24: Travel mileage cost for partner notification

Region	Field record (FR)related to partner notification	Total FR with field visit (including field record of selective screening)	Total travel mileage cost ($)	Travel mileage cost for partner notification field records ($)
Region 1	224	800	4437.76	1243
Region 2	328	805	11756.92	4790
Region 3	42	90	3046.16	1422
Region 4	359	575	11473.63	7164
Region 5	28	101	5914.64	1640
Region 6	71	126	3982.8	2244
Region 7	93	224	3582.44	1487
Region 8	158	246	15347.07	9857
Region 9	135	247	6347.75	3469
Total	1438	3204	65889.17	29572

Once the DIS was able to contact the partner, they were requested to come to the health units to get tested and treated (if required).

Table 25: Testing cost for partners

Test	Number	Cost/test	Total Cost
IGG	839	15.9	13340.1
VDRL Qualitative	316	11.13	3517.08
VDRL Quantitative	316	19.87	6278.92
FTA	3	51.67	155.01
RPR	108	4.1	442.8
TOTAL			23733.91

839 partners were tested at Louisiana Office of Public health units. 3 partners had FTA test done at the private provider sites and serology cost adjustment was taken into account by adding the cost at the state laboratory rate.

Costs incurred in every steps of partner notification are summarized below-

Table 26: Cost analysis of partner notification

Steps involved	Cost ($)
Clerical Cost for Patient Registration.	2519
Phlebotomist cost	4220
Nurse visit cost	13906
Testing cost	23734
Data specialist cost	4263
Epidemiologist costs for ELR data	2
Reactor received & Record Searched at regions	13810
Phone call cost	967
Phone call time cost	4511
Assigning FR to DIS	0.00
Time cost for field visit and leaving letter	9819
Travel time cost	52411
Travel mileage cost	29572
Case management cost by DIS	94385
Case management cost by DIS supervisor	34449
Case review at Central Office and data entry by epidemiologist	25931
Partner Notification cost	314499

Now, partner notification cost incurred after the selective screening, but as our objective was to compare the cost effectiveness between selective screening and selective screening with partner notification, so we need to add the cost of the selective screening with partner notification.

Table 27: Cost analysis of selective screening (SS) and partner notification (PN)

Steps involved	Cost of Selective Screening ($)	Cost of Partner Notification ($)
Clerical Cost for Patient Registration	440900	2519
Phlebotomist cost	738561	4220
Nurse visit cost	2433943	13906
Testing cost	2537888	23734
Data specialist cost	43354	4263
Epidemiologist costs for ELR data	3145	2
Reactor received & Record Searched at regions	46780	13810
Phone call cost	1110	967
Phone call Time cost	5178	4511
Assigning FR to DIS	10960	0.00
Time cost for field visit and leaving letter	9064	9819
Travel time cost	49318	52411
Travel mileage cost	36523	29572
TOTAL SS Cost	6356724	x x x x x
Case management cost by DIS		94385
Case management cost by DIS supervisor		34449
Case review at Central Office and data entry by epidemiologist		25931
Total PN Cost (including SS)		6671222

Cost Effectiveness of Selective Screening and Selective Screening with Partner Notification

The cost per case for detecting primary and secondary syphilis through selective screening is $14613 and selective screening combined with partner notification is $ 12196. So it can be seen that adding partner notification actually reduces the cost of case detection.

Table 28: Average cost per case of syphilis detection by selective screening and selective screening with partner notification

Stage of Syphilis	Average cost per case	
	Selective screening	Selective screening with partner notification
Primary & Secondary	$14613 (n=435)	$ 12196 (n=547)
Primary	$ 54331 (n=117)	$ 45076 (n=148)
Secondary	$ 19990 (n=318)	$ 16720 (n=399)
Early Latent	$ 11152 (n=570)	$ 9052 (n=737)
Early	$ 6325 (n=1005)	$ 5196 (n=1284)
Maternal	$ 90810 (n=70)	$ 78485 (n=85)

Sensitivity Analysis

Sensitivity analysis was done by using different contact indices, which is commonly used to measure syphilis control program effectiveness.

Contact Index= Number of individuals named as sex partners / Total number of index cases interviewed

For the current study,

Contact index = 1505/1113 = 1.35

According to CDC guidelines for STD program operations, the contact index used for evaluating interview outcome expectations are-

4.0 or higher – excellent, 3.0- above average, 2.5-average and 2.0-minimal

This sensitivity analysis alters the level of effectiveness for the selective screening combined with partner notification intervention based on CDC criteria described above.

Assumption regarding this hypothetical change is that the selective screening intervention will stay at the same level of case detection given changes to the partner notification intervention based on contact index of 2.0, 3.0 and 4.0.

Since Louisiana has a very low contact index of 1.35, so it is assumed that if the contact index can be increased to the minimal level as recommended by CDC, more cases can be detected. Increasing morbidity of syphilis every year supports this assumption.

For effective illustration of production effectiveness based on contact index, all percentages based on existing syphilis prevalence are held constant except for contact index.

Table 29: Sensitivity of selective screening with partner notification personnel productivity

Contact Index	Contacts named by interviewed cases (n=1113)	Primary Syphilis	Secondary Syphilis
1.35	1505	148	399
2	2230	163	438
3	3344	186	498
4	4459	209	518
Hypothetical increase of contacts elicited		Hypothetical increase of cases detected	

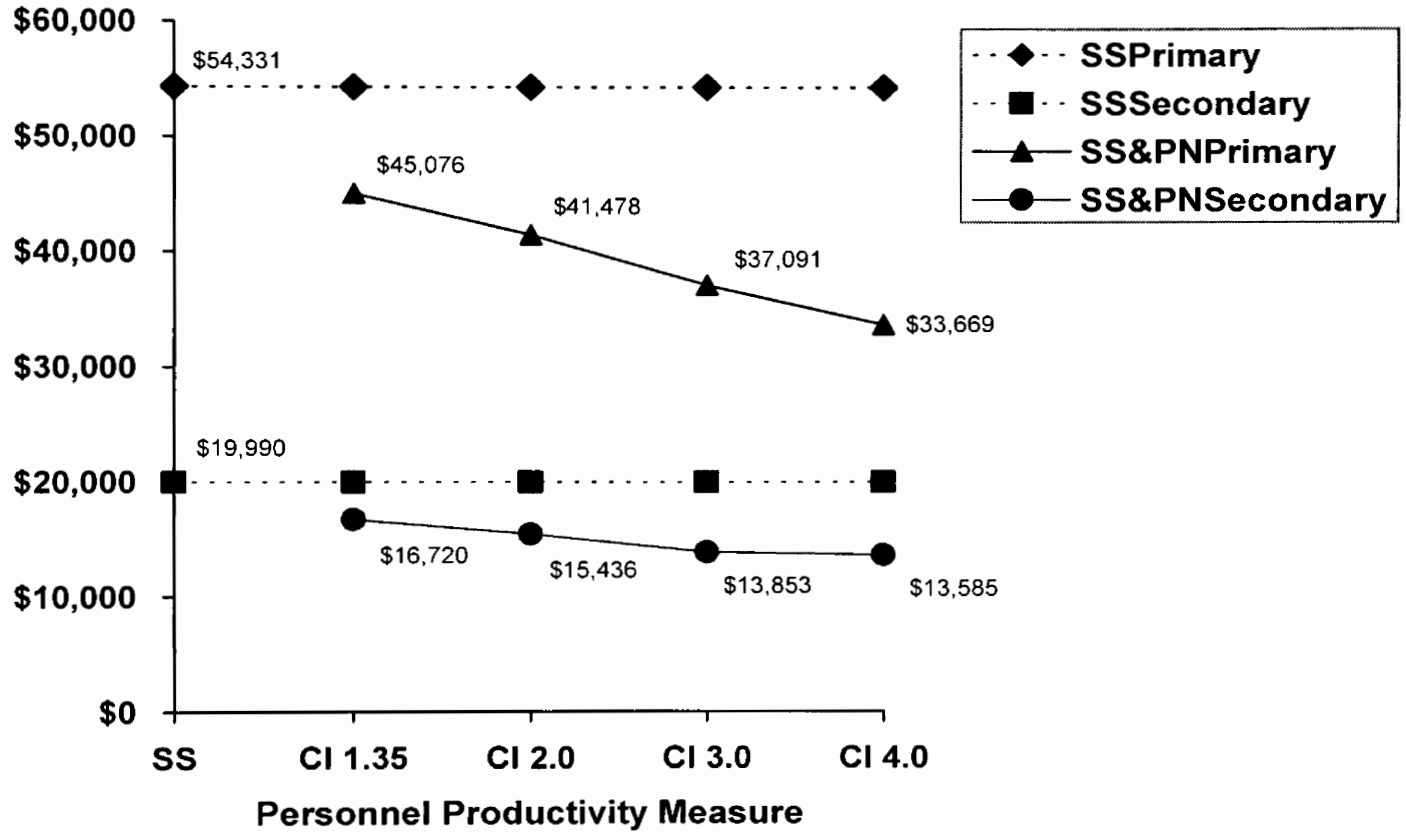
If the hypothetical increase in contact index can be achieved, then the cost will also increase as number of contacts increases shown in the table above.
The following table depicts the total cost for partner notification associated with the hypothetical increase of contact index.

Table 30: Cost analysis of partner notification ((PN) with different contact index

Steps involved	PN with CI=1.35 ($)	PN with CI=2.0 ($)	PN with CI=3.0 ($)	PN with CI=4.0 ($)
Clerical cost for Patient Registration	2519	3732	5597	7463
Phlebotomist cost	4220	6252	9376	12502
Nurse visit cost	13906	20605	30898	41200
Testing cost	23734	35167	52735	70319
Data specialist cost	4263	6317	9472	12631
Epidemiologist costs for ELR data	2	4	5	7
Reactor processing at regions	13810	20463	30685	40917
Phone call cost	967	1433	2149	2865
Phone call Time cost	4511	6684	10023	13365
Assigning FR to DIS	0	0	0	0
Time cost for field visit and leaving letter	9819	14549	21817	29091
Travel time cost	52411	77659	116453	155282
Travel mileage cost	29572	43818	65707	87616
TOTAL SS Cost	6356724	6356724	6356724	6356724
Case management cost by DIS	94385	107178	126834	146508
Case management cost by DIS supervisor	34449	34449	34449	34449
Case review and data entry by epidemiologist	25931	25931	25931	25931
Total PN Cost (including SS)	6671222	6760963	6898854	7036868

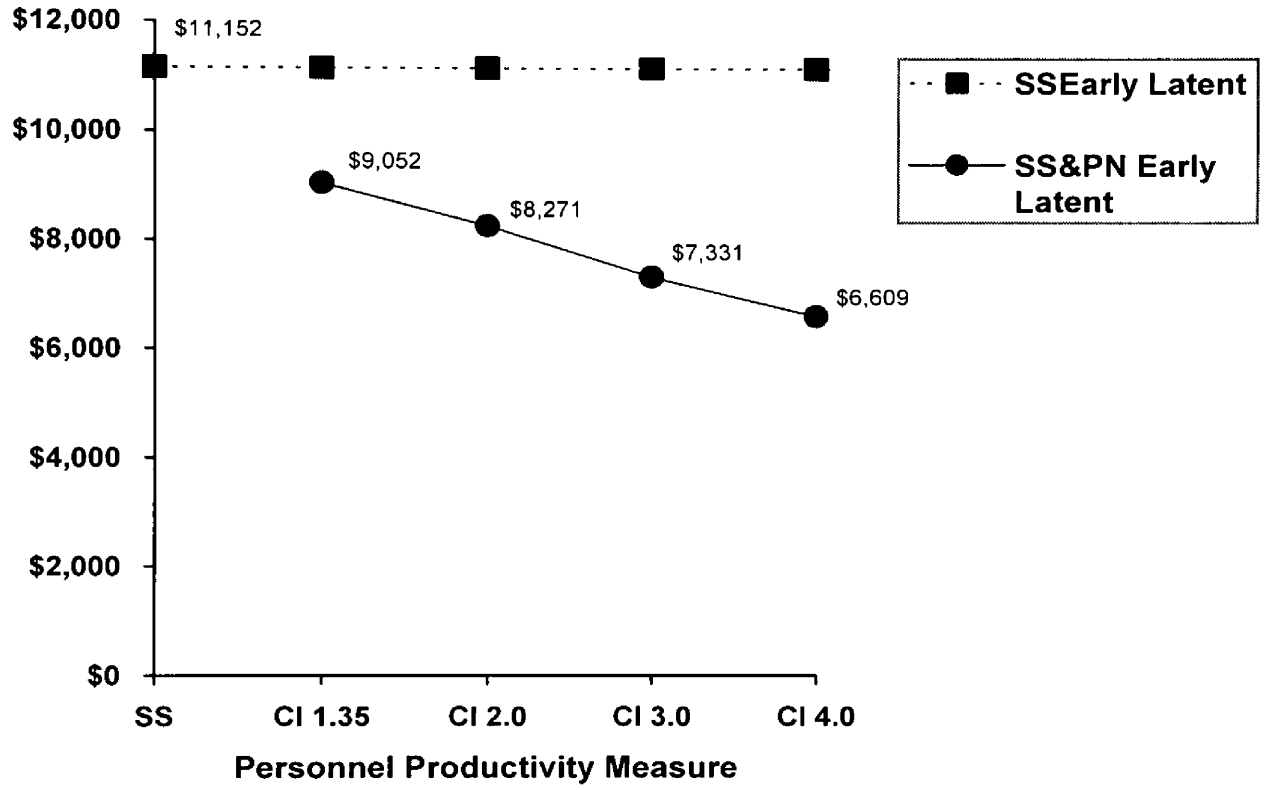
SS= Selective screening PN= Partner notification CI= Contact index

Figure 7: Contact Index sensitivity analysis for primary and secondary syphilis



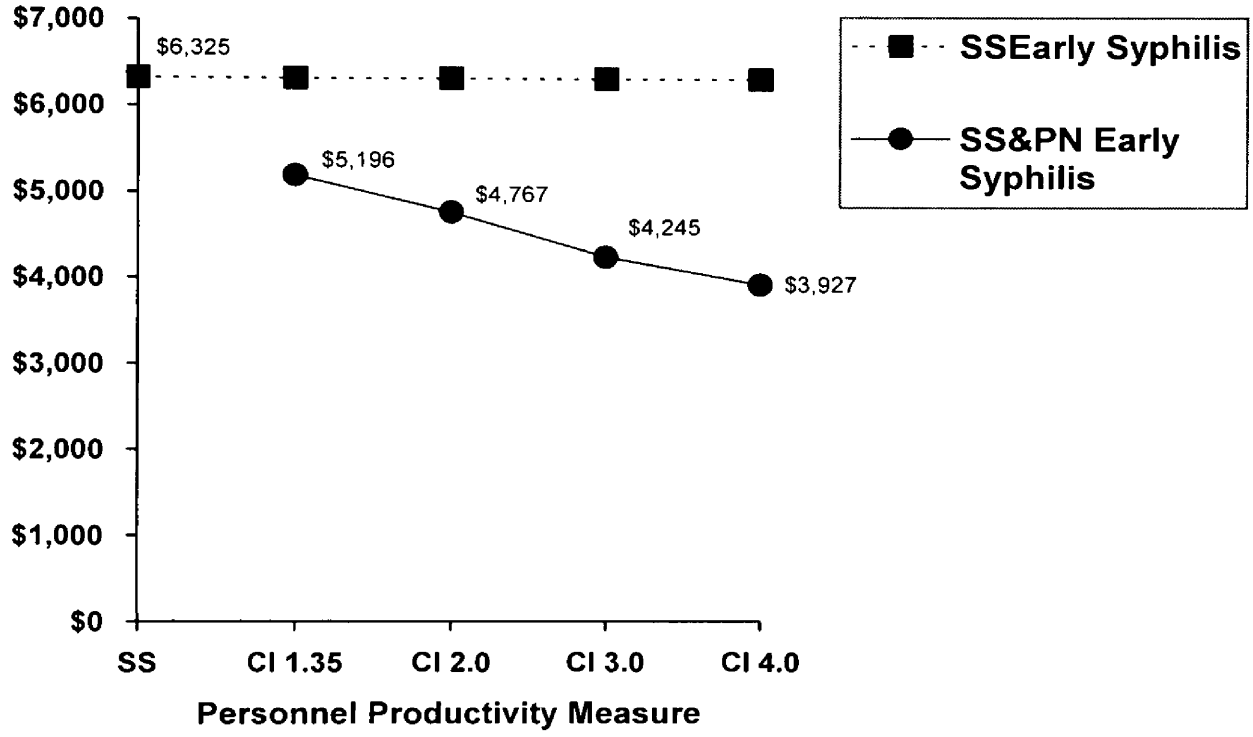
The sensitivity analysis figure shows that average cost for both primary and secondary syphilis case detection reduces with a higher contact index which resulted in more new cases. The reduction in cost is more in case of primary syphilis compared to secondary syphilis.

Figure 8: Contact Index sensitivity analysis for early latent syphilis



With the current contact index of 1.35, average cost of early latent case detection by selective screening with partner notification is $ 9052, which reduces to $ 6609 at contact index of 4.0

Figure 9: Contact Index sensitivity analysis for early syphilis (primary, secondary and early latent syphilis)



The sensitivity analysis figure shows that cost for all stages of syphilis reduces with a higher contact index which resulted in more new cases.

The impact of contact indices on average cost of detecting primary & secondary syphilis cases is presented in the following table. Costs for testing , processing lab results and contacting partners in response to the hypothetical increase of contacts were also considered.

Table 31: Primary and secondary syphilis detection costs per case as function of contact index

Contact Index	SS Primary	SS Secondary	SS &PN primary	SS &PN Secondary
1.35	$ 54331	$ 19990	$ 45076	$ 16720
2	$ 54331	$ 19990	$ 41478	$ 15436
3	$ 54331	$ 19990	$ 37091	$ 13853
4	$ 54331	$ 19990	$ 33669	$ 13585

SS = Selective Screening, PN = Partner Notification

This table shows that even if the minimal level of contact index which is 2.0 as per CDC guidelines, can be achieved, then cost for every primary syphilis detection will go down by $ 3598 and secondary syphilis cost will go down by $ 1284

The average cost per syphilis case as shown in the above table for selective screening with partner notification is actually a biased estimate. The reason it is biased because while cost was determined for the cases detected through partner notification, cases prevented through prophylactic treatment were not accounted for.

Prophylactic Treatment and Its Effect on Case Prevention

Prophylactic treatment, also known as preventive treatment is given to the contacts of infected cases. These contacts had a negative syphilis test result but since they are partners of infected cases and are highly likely to get infected any time so prophylactic treatment is recommended to prevent future infection.

Published estimates of the effectiveness of prophylactic treatment range from 0.07 to 0.45 with an average of 0.19 which means an average of 19 primary and secondary syphilis can be prevented by providing prophylactic treatment to 100 contacts.

The application of these estimates to the contacts who received prophylactic treatment suggested the number of cases prevented through prophylactic treatment. A total of 378 contacts were prophylactic ally treated in Louisiana in 2007.By applying prophylactic treatment effectiveness estimate it was suggested that 26 to 170 cases of syphilis were prevented. By applying the average estimate, it can be seen that 72 cases were prevented.

In fact, prophylactic treatment is more effective than detecting a primary case of syphilis as the prophylactic ally treated person has no chance of infecting others. All these cases which are prevented through prophylactic treatment should also be added with the cases identified through partner notification.

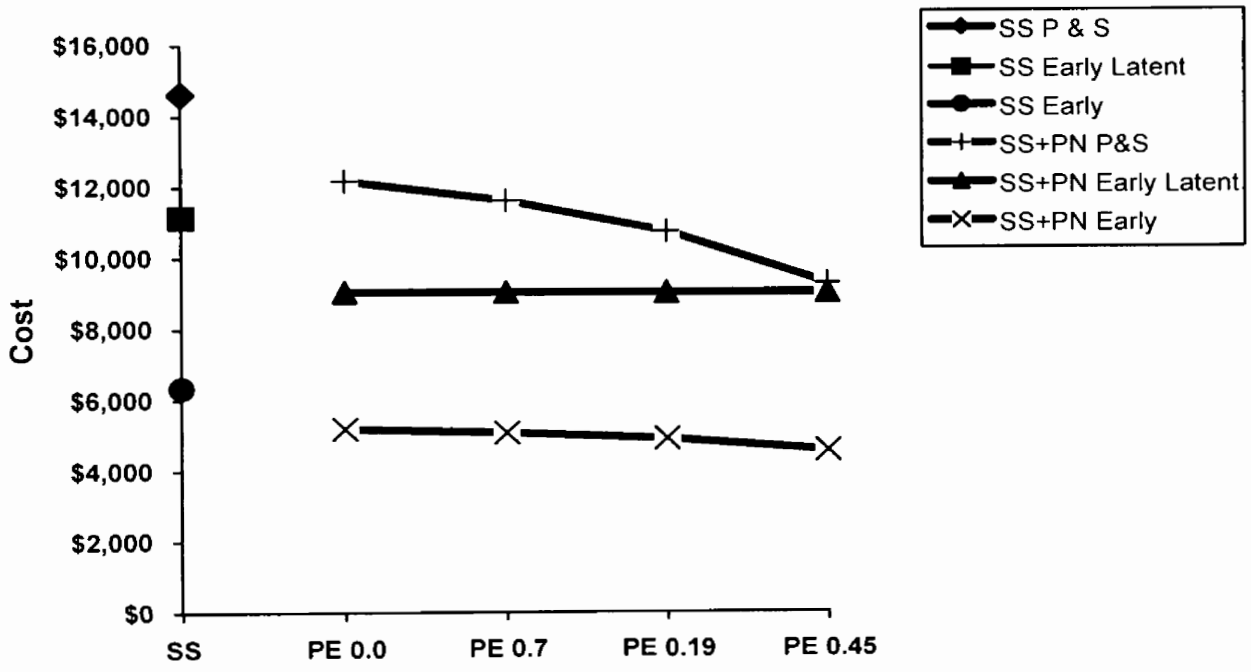
The following table shows the average cost per syphilis cases detected through selective screening, selective screening with partner notification (excluding cases prevented through prophylactic treatment) and selective screening with partner notification including cases prevented through prophylactic treatment at treatment effectiveness of 0.07, 0.19 and 0.45.

Table 32: Average cost per case of detected syphilis cases by selective screening and selective screening with partner notification (including cases prevented through prophylactic treatment)

Stage of Syphilis	Average cost per case				
	Selective screening	Selective screening with partner notification	Selective screening with partner notification (including cases prevented through prophylactic treatment at 0.07 treatment effectiveness)	Selective screening with partner notification (including cases prevented through prophylactic treatment at 0.19 treatment effectiveness)	Selective screening with partner notification (including cases prevented through prophylactic treatment at 0.45 treatment effectiveness)
Primary & Secondary	$14613 (n=435)	$ 12196 (n=547)	$ 11643 (n = 573)	$ 10777 (n = 619)	$ 9304 (n = 717)
Early Latent	$ 11152 (n=570)	$ 9052 (n=737)	$ 9052 (n = 737)	$ 9052 (n = 737)	$ 9052 (n = 737)
Early	$ 6325 (n=1005)	$ 5196 (n=1284)	$ 5093 (n = 1310)	$ 4920 (n = 1356)	$ 4588 (n = 1454)
Maternal	$ 90810 (n=70)	$ 78485 (n=85)	$ 78485 (n = 85)	$ 78485 (n = 85)	$ 78485 (n = 85)

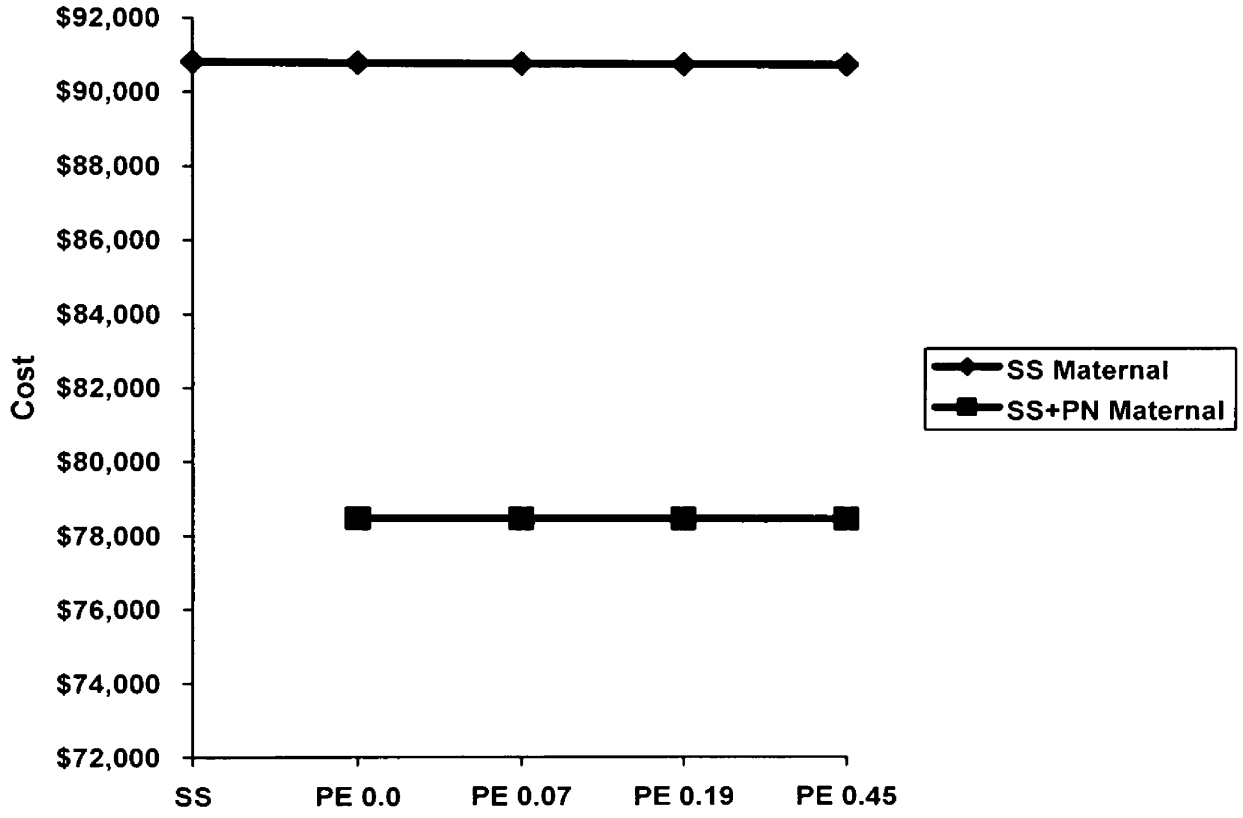
A total of $ 6407 was spent for providing prophylactic treatment to the contacts (16.95 per person) who had a negative syphilis test result (n=378). Costs include medicine cost and nurse time to administer the medicine.

Figure10: Average cost per case of detected syphilis cases by selective screening and selective screening with partner notification (including cases prevented through prophylactic treatment)



PE = Prophylactic treatment effectiveness

Figure11: Average cost per case of detected maternal syphilis cases by selective screening and partner notification (including prophylactic treatment effectiveness)



PE = Prophylactic treatment effectiveness

As it can be seen, in the above figure, the average cost per case for selective screening with partner notification was much lower, $78,485 per maternal case detected than selective screening alone, with a cost of $90,810 per maternal case detected.

A sensitivity analysis was done on the treatment cost per cases prevented by prophylactic treatment.

Table 33: Sensitivity analysis of treatment cost per primary and secondary syphilis case prevented by prophylactic treatment

Number of primary & secondary syphilis cases prevented	Treatment cost per case prevented
26	246.43
45	142.38
72	88.99
100	64.07
150	42.71
170	37.69

It can be seen in the above table that the more primary and secondary syphilis cases can be prevented through prophylactic treatment, the less will be the cost of treatment per case prevented. By increasing the contact index, the treatment cost per case prevented can be lowered easily.

Incremental Cost Effectiveness of adding Partner Notification with Selective Screening

So far we have estimated the average cost of detecting cases through selective screening and partner notification. But the most important part of this study is to estimate the incremental cost effectiveness of adding partner notification with selective screening.

The following formula was used to estimate the incremental cost effectiveness-

Incremental cost effectiveness $=(C_{SS+PN} - C_{SS}) / (E_{SS+PN} - E_{SS})$

where, C_{SS+PN} = Cost of selective screening with partner notification

C_{SS} = Cost of selective screening alone

E_{SS+PN} = Effectiveness of selective screening with partner notification

E_{SS} = Effectiveness of selective screening

Table 34: Incremental cost effectiveness of selective screening and selective screening with partner notification (without prophylactic treatment effectiveness)

Stage of Syphilis	C_{SS+PN} ($)	C_{SS} ($)	E_{SS+PN}	E_{SS}	Incremental cost effectiveness ($)
Primary & Secondary	6671222	6356724	547	435	2808
Primary	6671222	6356724	148	117	10145
Secondary	6671222	6356724	399	318	3883
Early Latent	6671222	6356724	737	570	1883
Early	6671222	6356724	1284	1005	1127
Maternal	6671222	6356724	85	70	20967

The incremental cost effectiveness shown in table 32 is a biased estimate because it did not take into account the primary and secondary syphilis cases prevented by prophylactic treatment. The following table shows the incremental cost effectiveness considering the prophylactic treatment effectiveness.

Table 35: Incremental cost effectiveness of selective screening and selective screening with partner notification (including 0.07 prophylactic treatment effectiveness)

Stage of Syphilis	C_{SS+PN} ($)	C_{SS} ($)	E_{SS+PN}	E_{SS}	Incremental cost effectiveness ($)
Primary & Secondary	6671222	6356724	573	435	2279
Early Latent	6671222	6356724	737	570	1883
Early	6671222	6356724	1310	1005	1031
Maternal	6671222	6356724	85	70	20967

Table 36: Incremental cost effectiveness of selective screening and selective screening with partner notification (including 0.19 prophylactic treatment effectiveness)

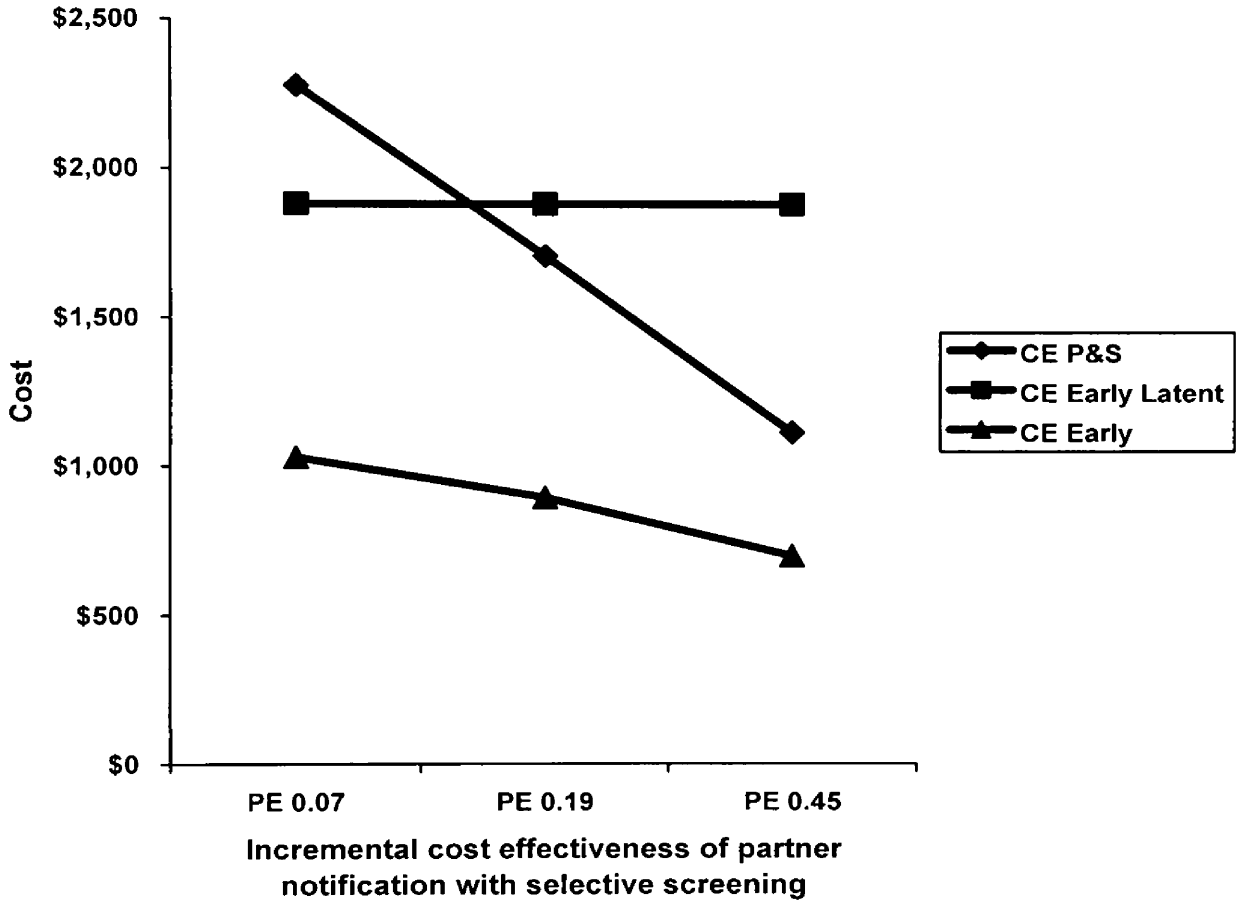
Stage of Syphilis	C_{SS+PN} ($)	C_{SS} ($)	E_{SS+PN}	E_{SS}	Incremental cost effectiveness ($)
Primary & Secondary	6671222	6356724	619	435	1709
Early Latent	6671222	6356724	737	570	1883
Early	6671222	6356724	1356	1005	896
Maternal	6671222	6356724	85	70	20967

Table 37: Incremental cost effectiveness of selective screening and selective screening with partner notification (including 0.45 prophylactic treatment effectiveness)

Stage of Syphilis	C_{SS+PN} ($)	C_{SS} ($)	E_{SS+PN}	E_{SS}	Incremental cost effectiveness ($)
Primary & Secondary	6671222	6356724	717	435	1115
Early Latent	6671222	6356724	737	570	1883
Early	6671222	6356724	1454	1005	700
Maternal	6671222	6356724	85	70	20967

The following figure depicts the incremental cost effectiveness of adding partner notification with selective screening including the cases prevented through prophylactic treatment at prophylactic treatment effectiveness of 0.07, 0.19 and 0.45

Figure 12: Incremental cost effectiveness of adding partner notification with selective screening



Cost Effectiveness of Intensity of Partner Notification

A total of 141 partner field records were sampled randomly to estimate the cost effectiveness of the intensity of partner notification. Variable 'attempt' was calculated by adding the number of phone call, field visit to the partner's address to notify them about their exposure to syphilis and to get tested and treated depending on the exposure status or test result and also field visit to leave a letter at a partner's address. Data was then analyzed to see how many contacts were reached by number of attempts and how many cases were among those contacts as well. Cost per attempt was estimated from the partner notification cost divided by total number of attempts made for all contacts. Total number of attempts for all contacts was estimated by applying the average number of attempts (which was 4.05) from the sampled contacts to all 1505 contacts. Cost per attempt was estimated as $ 26.21 from 6095 attempts made for 1505 contacts with a total cost of $ 159733.

Table 38: Cost analysis of intensity of partner notification

Attempt	Partner Attempted	Contacted	Unable to locate	Case	Cost ($)*	Average cost per partner ($)	Average cost per case ($)
1	141	13	2	2	3695.61	284.28	1847.81
2	126	37	7	8	6998.07	189.14	874.76
3	97	60	12	12	9540.44	159.01	795.04
4	69	74	15	14	11348.93	153.36	810.64
5	52	90	16	17	12711.85	141.24	747.76
6	35	100	18	19	13629.2	136.29	717.33
7	23	108	19	23	14232.03	131.78	618.78
8	14	112	19	24	14598.97	130.35	608.29
9	10	118	20	26	14861.07	125.94	571.58
10	3	121	20	27	14939.7	123.47	553.32

* calculated by multiplying number of attempt with cost per attempt of $26.21

Among the sampled field records, up to 10 attempts were done to contact the partners. The more attempts were made the more partners as well cases were identified. But after 5 attempts, the number of partners identified started to decline. First 3 attempts identified about 45% cases among the partners and 70% cases among the partners were identified by 6 attempts. Interestingly, the more attempts were made the less average cost per partner as well as average cost per case was noted.

Table 39: Incremental cost effectiveness of intensity of partner notification

Attempt	Partner attempted	Contacted	Case	Cost ($)*	Incremental cost effectiveness (case)	Incremental cost effectiveness (partner)
1	141	13	2	3695.61	550.41	137.60
2	126	37	8	6998.07	635.59	110.54
3	97	60	12	9540.44	904.25	129.18
4	69	74	14	11348.93	454.31	85.18
5	52	90	17	12711.85	458.68	91.74
6	35	100	19	13629.2	150.71	75.35
7	23	108	23	14232.03	366.94	91.74
8	14	112	24	14598.97	131.05	43.68
9	10	118	26	14861.07	78.63	26.21
10	3	121	27	14939.7		

Despite it was found that average cost per case was declining with more attempts made but the incremental cost effectiveness of intensity of partner notification didn't show any significant result. While identifying case through partner notification, it was more expensive to make more attempts up to 3 attempts. Similar scenario was also noted for incremental cost effectiveness for identifying partners.

Low sample size (141 field records were used for this analysis) might have played a role in such a mixed result.

CHAPTER 6

DISCUSSION

Cost Effectiveness of Selective Screening and Selective Screening with Partner Notification

The finding of this study showed that selective screening combined with partner notification is more cost effective than selective screening alone.

Average cost per case in selective screening for primary and secondary syphilis cases combined was $ 14613 where as even without considering the impact of prophylactic treatment, when partner notification was added with selective screening, it went down to $ 12196 per primary and secondary syphilis cases detected .For early latent cases, average cost per case was $ 11152 for selective screening and $ 9052 for selective screening with partner notification.

For maternal syphilis cases, average cost per case detected by selective screening was $ 90810 and for selective screening with partner notification the average cost per case was $ 78485.

When the impact of prophylactic treatment was considered, the average cost per primary and secondary syphilis cases detected through selective screening with partner notification was even lower. At 0.07 prophylactic treatment effectiveness, which is considered the minimum effectiveness, the average cost per primary

and secondary syphilis cases detected was $ 11643. At prophylactic treatment effectiveness of 0.19 (considered the average effectiveness) and 0.45 (considered the maximum effectiveness) the average cost per primary and secondary syphilis cases detected was $ 10777 and $9304 respectively.

The findings of incremental cost effectiveness (without considering prophylactic treatment effectiveness) showed that it costs $ 2808 to detect an additional primary or secondary syphilis case by adding partner notification with selective screening. When the prophylactic treatment effectiveness of 0.07, 0.19 and 0.45 are taken into account, the incremental cost effectiveness for each additional primary and secondary syphilis case further decreases to $ 2279, $ 1709 and $1115 respectively.

This is encouraging because there has been always a debate whether partner notification should be still kept in practice because of high cost or more screening should be done in high morbidity areas. Cost effectiveness study like this one may become the basis of determining whether to continue, modify, discard or selectively implement traditional practices.

How ever, even though one approach is more cost effective than the other but the high cost of detecting syphilis by both approach should be a concern. Having high morbidity of syphilis in Louisiana which is also increasing at an alarming rate every year, this high cost should be a major concern as there is always deficit in budget in current economy. STD Control programs are getting budget cut all over USA and in such situation alternative or modified approaches of current practice of syphilis control and prevention is mandatory. Besides, high cost of DIS based

partner notification might not be feasible in developing countries with high syphilis morbidity. Prior to implementing such approach in developing countries, a cost effectiveness study should be done on a pilot area.

This study provides the estimates of the cost and effectiveness of selective screening and partner notification in Louisiana in 2007. More cases of primary and secondary syphilis cases were detected through selective screening, than partner notification alone but on the other hand, less people needed to be screened for detecting case in partner notification. Our hypotheses was selective screening should be supplemented by partner notification to make the case detection more cost effective and the findings suggest that too. One of the advantages of partner notification is that it helps high risk population who are none but partners of active cases to get evaluated. This helps in detecting and preventing syphilis in those highly exposed population.

Prophylactic treatment of contacts were responsible for making selective screening combined with partner notification even more cost effective compared to selective screening alone. Identifying and providing prophylactic treatment to non infected partners showed a reduction in the average cost per case detected as well has a better incremental cost effectiveness ratio. Failure to identify these non infected partners who are highly likely to become infected at some point also increases the spread of the disease as well as the burden of the disease.

Sensitivity analyses also indicates that an increase in the contact index, which is a measure of DIS productivity , would make selective screening combined with

partner notification more cost effective than what is now with the current low contact index. If the current contact index of 1.35 can be increased to 2.0 (CDC recommended minimum contact index) then average cost for every primary syphilis case detection will reduce by $ 3598 and for secondary syphilis the average cost per case will reduce by $ 1284.

Cost Effectiveness of Intensity of Partner Notification

The study showed that that the more attempts are made, the more partners and cases among those partners were identified which also resulted in lower average cost per partner or cases identified. Among 141 sampled field records it was seen that with first attempt only 13 partners were contacted and 2 of those partners turned out to be cases. With 5 attempts, 90 partners were contacted and 17 of them were cases. With 10 attempts, 121 partners were contacted and 27 of those partners were identified as cases. So the finding suggested that there was no optimum number of attempts. Average cost per partner and case also decreased with increased number of attempts. At first attempt, the average cost per partner was $284 and average cost per case was $1848 where as at tenth attempt the cost per partner and case were $ 123 and $ 553 respectively.
The incremental cost effectiveness of intensity of partner notification showed that the more attempts are made, the more cost effective it was in contacting partners but the findings of incremental cost effectiveness of identifying cases did not show a significant pattern.

Use of Resources in Syphilis Control in Louisiana

Louisiana's contact index for 2007 was 1.35 which is below the minimum level of 2.0 as recommended by CDC. Contact index is always dependent on the number of contacts or partners initiated and number of cases interviewed. Usually, the more cases can be interviewed, the more is chance of eliciting partners. Also, if all the CDC recommended steps related to interview can be followed, it is highly likely to be able to elicit more partners. But a proper interview also depends on the number of case load a DIS has to work on regularly.

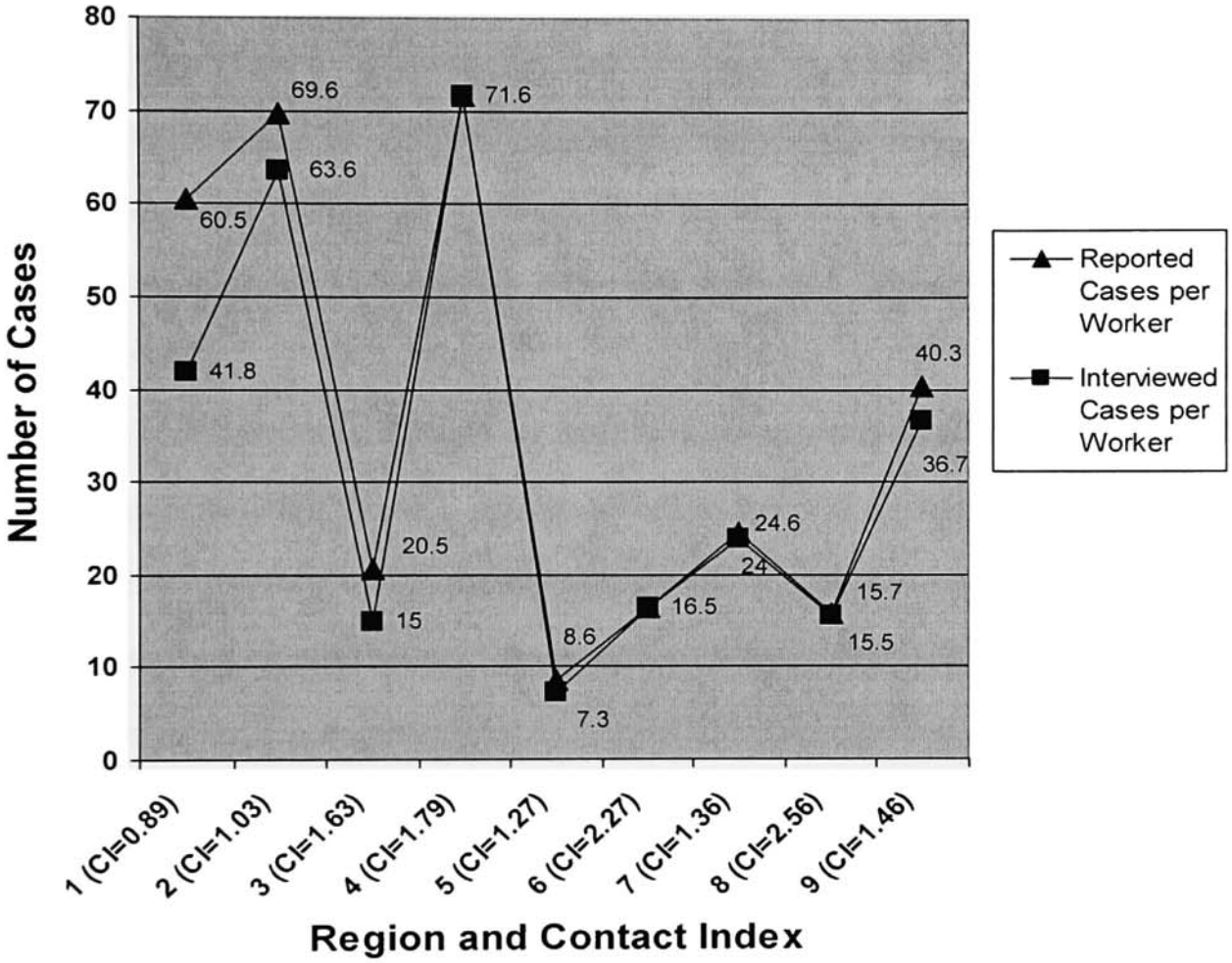
According to the Louisiana STD program operational guideline, syphilis cases should be closed within 45 days of the diagnosis of the index case. Closing of a case means interviewing the index case, initiating all the partners, testing and treating (if required) all the partners initiated and completion of the syphilis interview record of the index case and submission of the case to the STD control program central office. This deadline can be affected by the case load of the Disease Intervention Specialist (DIS). If a DIS has more case load then he or she might not be able to interview all the cases properly resulting in a lower contact index.

Table 40: Case load and impact on contact index in each public health region in Louisiana

Region	Cases Reported	Cases Interviewed	No. of DIS	Reported cases per DIS	Interviewed cases per DIS	Contacts Initiated	Contact Index
1	363	251	6	60.5	41.8	223	0.89
2	348	318	5	69.6	63.6	327	1.03
3	41	30	2	20.5	15	49	1.63
4	215	215	3	71.6	71.6	385	1.79
5	26	22	3	8.6	7.3	28	1.27
6	33	33	2	16.5	16.5	75	2.27
7	74	72	3	24.6	24	98	1.36
8	63	62	4	15.7	15.5	159	2.56
9	121	110	3	40.3	36.7	161	1.46

It can be seen in the above table that case load has affected the number of cases interviewed by DIS in high morbidity regions and also has an impact on contact index. Public health regions having higher case load per DIS has lower contact index (except region 4) which in turn hampers control and prevention of syphilis in Louisiana.

Figure 13: Case load and impact on contact index in each public health region in Louisiana



Disease intervention specialist turnover in region 1 has resulted in lower contact index as well. Few experienced DIS have retired or moved to different programs and those positions were replaced with new DIS. Lack of experience of these new DIS, specially interviewing syphilis cases also lead to lower contact index in addition to higher case load.

69.1% of reported syphilis cases were interviewed in region 1 in 2007 which also has the second highest case load among the public health regions and the lowest contact index. Regions 6, 7, 8 and 9 have relatively lower case loads resulting in more than 90% reported cases being interviewed.

It can be seen in the above table that public health region 8 had the highest contact index of 2.56 with work load of 15.7 cases per DIS. On the other hand, public health region 1 had the lowest contact index of 0.89 with work load of 60.5 cases per DIS.

Based on these findings, it might be worthy to identify the optimum case load across public health regions. Average 16 cases per DIS had the highest contact index of 2.56, the next best contact index was 2.27 with a case load of about 17 cases. The third highest contact index was 1.79 with case load of 71 cases per DIS. So to achieve a contact index of 2.0 (CDC recommended minimum contact index for syphilis control programs) average 43 cases per DIS is required.

The following table depicts the number of DIS will be required to achieve a contact index of 2.0 across public health regions in Louisiana

Table 41: Required Disease Intervention Specialists to achieve 2.0 contact index

Region	Cases Reported	Actual no. of DIS	Actual contact Index	Required no. of DIS
1	363	6	0.89	8
2	348	5	1.03	8
3	41	2	1.63	1
4	215	3	1.79	5
5	26	3	1.27	1
6	33	2	2.27	1
7	74	3	1.36	2
8	63	4	2.56	1
9	121	3	1.46	3
Total	1284	31		30

It can be seen that the estimated required number of DIS to achieve a contact index of 2.0 are less than current total number of DIS in Louisiana. But the distribution within the regions shows a different picture. Region 1, 2 and 4 need more DIS than they currently have and on the other hand region 3, 5, 6 and 7 should have less DIS than their current numbers. So it is obvious that reallocation of resources namely DIS can actually improve the contact index as well as better control of syphilis in Louisiana.

Implications

The findings of this study have the following implications:

- This study helped to know about the total cost of selective screening and partner notification in Louisiana.

Table 42: Cost analysis of selective screening and partner notification by major cost components

Cost component	Selective screening	Partner notification
Testing cost	2537888	23734
Phone call	1110	967
Personnel cost	3451203	260226
Travel cost	366523	29572
Total	6356724	314499

- The findings of this study also helped to know resource needs and necessary steps to scale up this project of syphilis control in Louisiana.
- This study identified that the current numbers of Disease Intervention Specialist is enough to obtain CDC recommended minimum contact index. Only necessary step would be to reallocate resources mainly DIS.
- Procedures followed by the Louisiana STD control program staffs which are non compliant to the operational guidelines were identified resulting in

necessary actions to correct those and thus helped to improve the program performance.

- The findings also helped to modify the operational guideline for Disease Intervention Specialists and their supervisors.

Recommendations

Based on the findings of this study the followings are recommended:

- Relocation of staffs from low morbidity to high morbidity regions, which will reduce the case load, improve the percentage of cases interviewed and ultimately improve the contact index and lower the cost of case detection.
- Higher contact index by increasing DIS productivity will help in identifying more cases as well as prevent the spread of syphilis in the community. Preventive treatment of more non infected partners will also help in reduction of the cost of case detection and spread of the disease.
- Phlebotomists should be hired for drawing blood from the patients rather than the nurses drawing the blood. This will also lower the cost of case detection as the salary of the phlebotomists is less than 50% of the salary of the nurses.

- Time motion study can be done in future to estimate the actual time spent by the STD control staffs for each task rather than obtaining these estimates from interview.

Assumptions

The following assumptions were made for this study:

- Total number of blood samples processed for 641 early syphilis cases detected at jails, hospitals (private and public) and other private provider sites were unknown. We assumed that same proportion of tests was done for the cases detected outside of the state laboratory. By applying the same proportion of number of samples processed at the state laboratory (53818 samples were processed to detect 367 early syphilis cases) we estimated that 93558 samples were processed to detect 641 cases outside of state laboratory.
- The cost of travel for field visits were obtained from the travel bills paid to the DIS at every region from January to June of 2009. As the syphilis morbidity for previous years showed that morbidity remains pretty much similar between first and second half of the year so an assumption was made that it would remain similar for 2009 as well. Data up to November 2009 supports this assumption. Based on this assumption, further assumption was made that traveling would also remain same between the

two halves of the year. So by doubling the travel bill for first half of 2009 the total travel bill for 2009 was estimated.

- We assumed that similar personnel and cost was involved in screening and detecting cases at non Louisiana Office of Public Health sites (jails, private and public hospitals and other private provider sites).

Limitations

There are several limitations in this study:

- Individual specific cost was not used.
- Average and estimated costs were used instead of actual cost.
- Sample size was relatively low which indicates that there might be some bias in various estimations.
- Since time spent for various activity was obtained by interview, so there was subjective reporting resulting in lumping of time spent as well as possibility of over estimation of time spent for each task.

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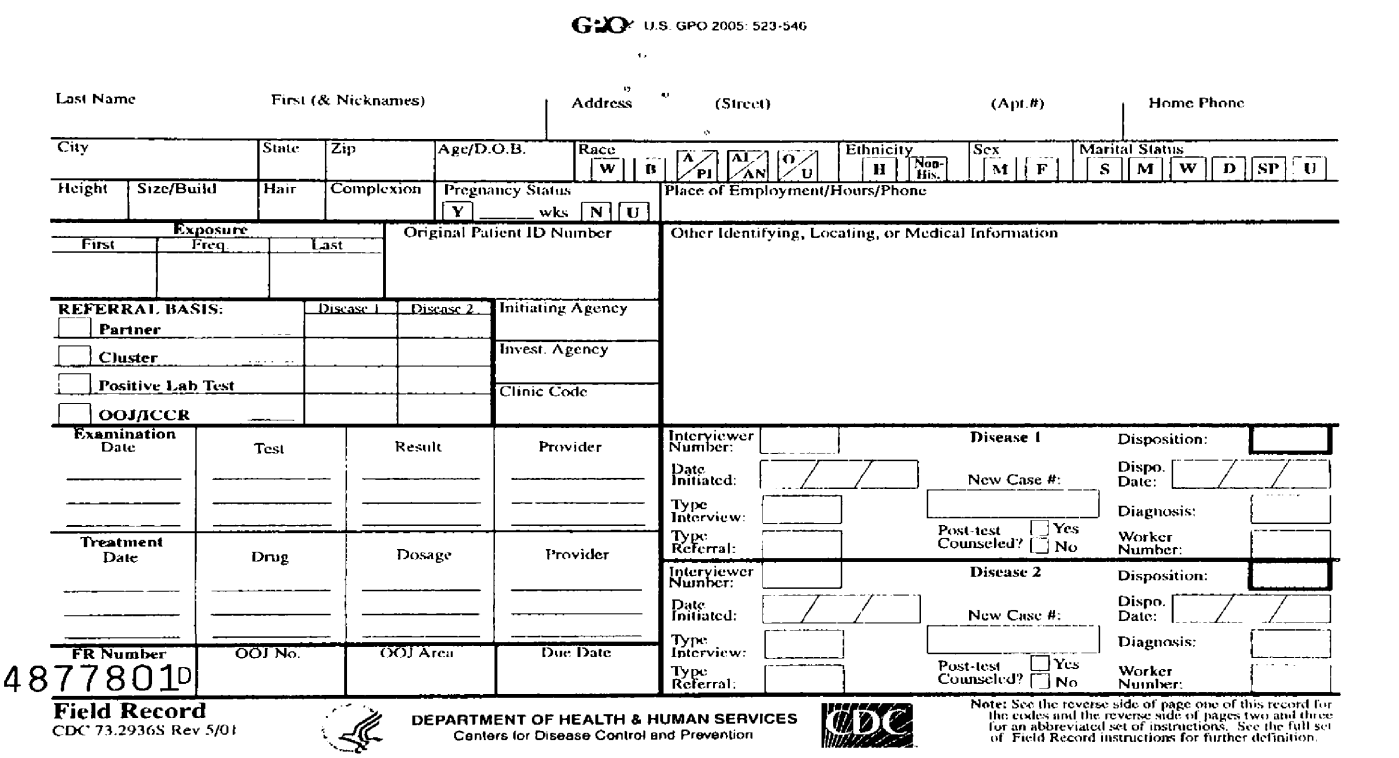
APPENDICES

Syphilis Field Record



GPO U.S. GPO 2005: 523-546

Last Name | First (& Nicknames) | Address (Street) (Apt.#) | Home Phone

City | State | Zip | Age/D.O.B. | Race W B A/PI AI/AN O/U | Ethnicity H Non-His. | Sex M F | Marital Status S M W D SP U

Height | Size/Build | Hair | Complexion | Pregnancy Status Y ____ wks N U | Place of Employment/Hours/Phone

Exposure: First | Freq | Last

Original Patient ID Number

Other Identifying, Locating, or Medical Information

REFERRAL BASIS: Disease 1 | Disease 2 | Initiating Agency | Invest. Agency | Clinic Code

- Partner
- Cluster
- Positive Lab Test
- OOJ/ICCR

Examination: Date | Test | Result | Provider

Treatment: Date | Drug | Dosage | Provider

FR Number | OOJ No. | OOJ Area | Due Date

4877801D

Interviewer Number: | Date Initiated: | Type Interview: | Type Referral:

Disease 1: New Case #: | Post-test Counseled? Yes No | Disposition: | Dispo. Date: | Diagnosis: | Worker Number:

Disease 2: New Case #: | Post-test Counseled? Yes No | Disposition: | Dispo. Date: | Diagnosis: | Worker Number:

Field Record
CDC 73.2936S Rev 5/01

DEPARTMENT OF HEALTH & HUMAN SERVICES
Centers for Disease Control and Prevention

CDC

Note: See the reverse side of page one of this record for the codes and the reverse side of pages two and three for an abbreviated set of instructions. See the full set of Field Record instructions for further definition.

Syphilis Interview Record

Interview Record

Note: See the reverse side of page one of this record for the codes and the reverse side of pages two and three for an abbreviated set of instructions. See the full set of Interview Record instructions for further definition.

Disease: 1. [ ] 2. [ ]

Control Number: A 3010010

Patient Name (Last) | (First & Nicknames) | Case # | Inform ID.

Home Address (Street) | City | Res. Co. | State | Zip Code | Home Phone

Date of Birth | Age | Race: W B A/PI AI/AN O/U | Ethnicity: H Non-His. | Sex: M F | Pregnant? Y ___ Wks. N U | Pregnancy in Last 12 Mos.? Y N U

Method of Case Detection:
- [ ] Provider Ref. To: ____
- [ ] Cluster To: ____
- [ ] Patient Ref. To: ____
- [ ] Prenatal
- [ ] Delivery
- [ ] Instit. Screening
- [ ] Community Screening
- [ ] Reactor
- [ ] Provider Report
- [ ] Volunteer

Information Source

Supv. No. | **Clinic Code** | **Medical Record No.**

	Date Assigned	Assigned to Wkr:	Date Treated	Case IX'D?	Interview Period	Period Partners Sex	N/S	Both
1.								
2								

Since 1978: (Check All That Apply) — Initial / Final
1. Sex w/ Male? Y Y
2. Sex w/ Female? Y Y
3. Used IV drugs? Y Y
4. Hemophilia? Y Y

Known Heterosexual Relations w/:
5. IVDU? Y Y
6. Bisexual Male? Y Y
7. Person w/ Hemophilia? Y Y
8. HIV Positive Transfusion Recip.? Y Y
9. Person w/ AIDS or HIV Risk UNK ? Y Y
10. One Born in Pattern II? Y Y
11. Rec'd Blood Transfusion? Y Y
12. Worked in Health Care Setting? Y Y
13. Sex for Drugs/Money? Y Y

1. Pre-Test Counseled? Y N
2. Tested for HIV? Y N R
3. Post-Test Counseled? Y N

Previous HIV Test: No P N I U — Date: ____ Provider: ____

Current HIV Test: No P N I U — Date: ____ Provider: ____

Symptoms: Onset Date	Duration (Days)	Description	Lab Results: Date	Test	Result	Treatment	Other Infections
						1.	
						2.	

INT No.	Date of Interview	Type	P CL	Ref	Exposure Dates: First	Freq.	Last	FR Num	Name	Sex	Disease 1: Disp	Disp Date	Diag	Wkr. No.	Disease 2: Disp	Disp Date	Diag	Wkr. No.	Post Test CNSL	SO SP	Invst Agen
1																					
2																					
1																					
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CDC 73.54 3-2002

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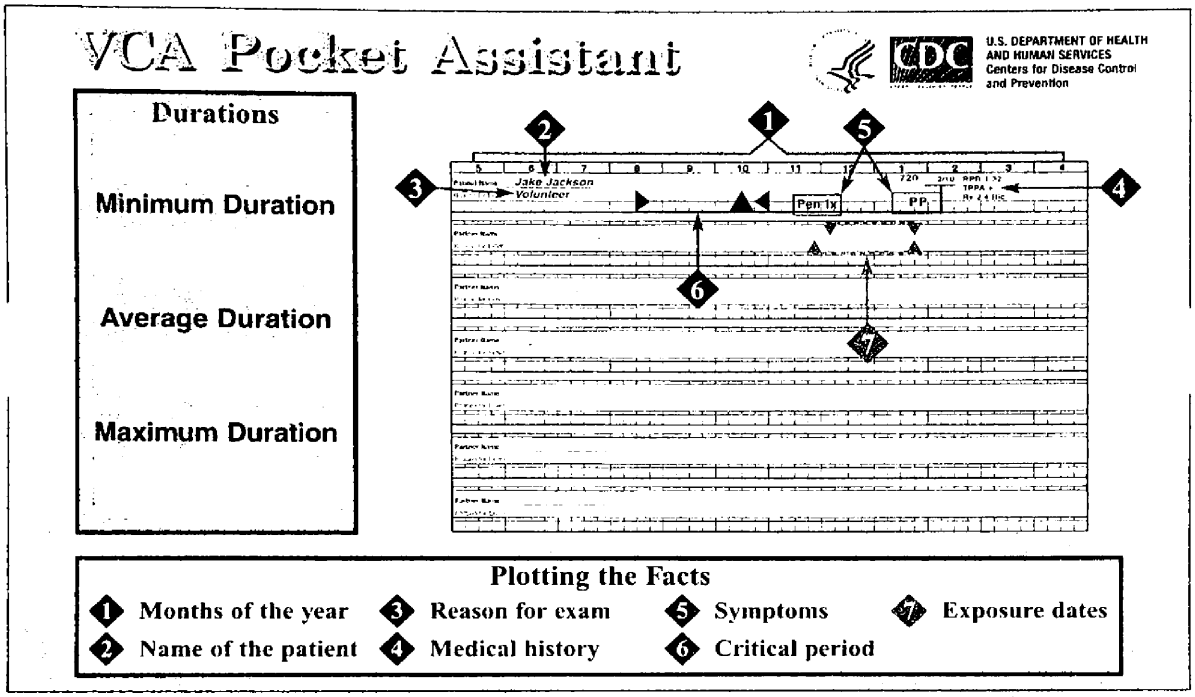
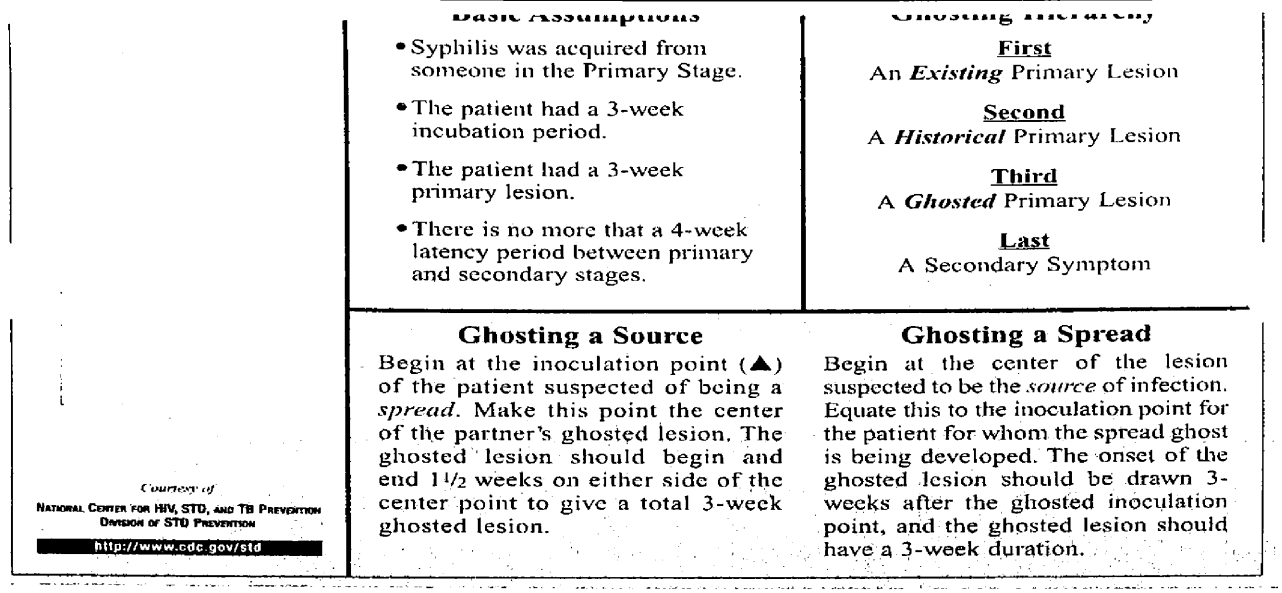
Public Health Service
Centers for Disease Control and Prevention

Visual Case Analysis (VCA) sheet



Durations

Incubation Period	Primary Symptoms	Latency – 710 to 720	Secondary Symptoms
Minimum Duration	Minimum Duration	Minimum Duration	Minimum Duration
10 Days	1 Week	0 Weeks	2 Weeks
Average Duration	Average Duration	Average Duration	Average Duration
21 Days	3 Weeks	4 Weeks	4 Weeks
Maximum Duration	Maximum Duration	Maximum Duration	Maximum Duration
90 Days	5 Weeks	10 Weeks	6 Weeks



Primary Syphilis	Secondary Syphilis	Early Latent Syphilis
Begin 3 months ***prior*** to the onset of primary symptoms as given by the patient.	Begin 6½ months ***prior*** to the onset of secondary symptoms as given by the patient.	Begin 12 months ***prior*** to the date of adequate treatment

History and Exam Form 39A (used by Nurses)

LOUISIANA DEPARTMENT OF HEALTH and HOSPITALS
OFFICE OF PUBLIC HEALTH
SEXUALLY TRANSMITTED DISEASES (STD) MEDICAL RECORD

FEMALE EXAM **DATE** _____ **CHART#** _____

(Affix Label Here)

Last Name _____ First _____ MI ____
DOB _____ Age _____ Social Security # _____
Address _____ Parish _____
City _____ State _____ Zip _____
Phone (Home) _____ (Cell) _____
Emergency Contact _____ Phone _____

Race Black White American Indian/Alaska Native Asian Pacific Islander Unknown
Ethnicity Hispanic Non-Hispanic
Marital Status Single Married Living W/Partner Divorced Widowed

1. TYPE OF VISIT Appointment Walk-In

2. REASON FOR VISIT

STD Symptoms
Check-Up (No S/S)
HIV Test Only
Follow-Up Visit
Results
Other _____
Partner W/STD
DIS Referral
Treatment For Positive Test
Referred By Other Agency

3. CHIEF COMPLAINT/DURATION

None
Dysuria _____
Rash _____
Genital Swelling _____
Other _____
Discharge _____
Lesion/Sore _____
Genital Itching _____
Abdominal/Pelvic Pain _____
Partner With Symptoms _____

4. MEDICAL HISTORY

Prior STD Month/Year

None
Gonorrhea _____
Herpes _____
Chancroid _____
PID _____

Prior STD Month/Year

Syphilis _____
Chlamydia _____
Warts _____
HIV _____
Other _____

Date Of Most Recent HIV test _____

Significant Medical Problem Yes No

Any Meds In Last Two Weeks Yes No

Drug Allergies Yes No

Name Of Medication / Date / Type Of Reaction _____

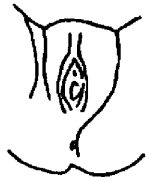
5. SEXUAL HISTORY

Sexual Preference Male Female Both
Exposure Site Oral Genital Anal
Possible Polygamous Partner Yes No
Condom Usage Always Sometimes Usually
Birth Control Method _____
Gravida _____ Para _____
Pregnant Now Yes No Breastfeeding Yes No

Date of Last Sexual Exposure _____
New Partner Within the Last 3 Months Yes No
Total Number Of Partners Within Last 3 Months M ___ F ___ 12 Months M ___ F ___
With Last Sex Exposure Never
GYN History LMP _____
_____ Normal X _____ Days _____ Abnormal
Last Pap Smear Date _____ Normal Abnormal

6. PHYSICAL ASSESSMENT

	WNL	Not Assessed	Findings
Skin			Palmar/Plantar Rash Intertrigo Folliculitis Molluscum Cont Scabies Rash Other
Pubic Hair			Crabs/Nits Folliculitis Other
Inguinal Nodes			Enlarged Tender Bilateral Unilateral Other
Vulva-Vagina			Erythema Ulcer Vesicles Rash Wart Bartholin Cyst Other Discharge Amount: Scant Moderate Large Color: Clear White Yellow Consistency: Thin Thick Frothy
Cervix			Mucro-Purulent Discharge Friable Ectropion Eversion Lesion Nabothian Cyst Other None (Hysterectomy) Cervical OS Nullip Parous Stenotic
Bimanual			Cervical Motion Tenderness Adnexal Tenderness Uterine Fundal Tenderness Other
Uterine Size			Abnormal
Uterine Shape			Abnormal
Uterine Position			Abnormal
Perianal area			Perianal Ulcer Vesicle(s) Fissure Warts Other
Oro-Pharynx			Ulcer Exudate Patches Other



Description of Abnormal Findings _____

Breast Self-Exam Taught Yes No

7. STAT LABORATORY

None Ordered	RESULTS		RESULTS		RESULTS
RPR	_____	WBC	_____	Pregnancy	_____
Darkfield	_____	Ph	_____	Rapid HIV Test	_____
Microscopy	_____	Clue Cells	_____	TB Skin Test	_____
Trich	_____	Whiff Test	_____	Other	_____

STD-39-B (R 07/08)

History and Exam Form 39B (used by Nurses)

LOUISIANA DEPARTMENT OF HEALTH and HOSPITALS
OFFICE OF PUBLIC HEALTH
SEXUALLY TRANSMITTED DISEASES (STD) MEDICAL RECORD

MALE EXAM **DATE** _____ **CHART#** _____

(Affix Label Here)

Last Name _____ First _____ MI ____
DOB _____ Age ____ Social Security # _____
Address _____ Parish _____
City _____ State _____ Zip _____
Phone (Home) _____ (Cell) _____
Emergency Contact _____ Phone _____
Race | Black | White | American Indian/Alaska Native | Asian | Pacific Islander | Unknown
Ethnicity | Hispanic | Non-Hispanic
Marital Status | Single | Married | Living W/Partner | Divorced | Widowed

1. TYPE OF VISIT Appointment Walk-in

2. REASON FOR VISIT
STD Symptoms | Partner W/STD
Check-Up (No S/S) | DIS Referral
HIV Test Only | Treatment For Positive test
Follow-Up Visit | Referred By Other agency
Results
Other _____

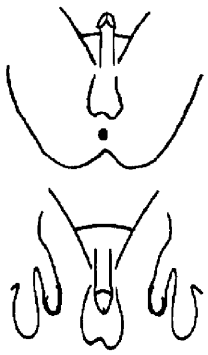
3. CHIEF COMPLAINT/DURATION
None | Discharge _____
Dysuria _____ | Lesion/Sore _____
Rash _____ | Genital Itching _____
Genital Swelling _____ | Abdominal/Scrotal Pain _____
Other _____ | Partner With Symptoms _____

4. MEDICAL HISTORY
Prior STD Month/Year | Prior STD Month/Year
None | Chlamydia _____
Gonorrhea _____ | Warts _____
Herpes _____ | HIV _____
Chancroid _____ | Other _____
Syphilis _____
Date Of Most Recent HIV test _____
Significant Medical Problem Yes No
Any Meds In Last Two Weeks Yes No
Drug Allergies Yes No
Name Of Medication / Date / Type Of Reaction _____

5. SEXUAL HISTORY
Sexual Preference Male Female Both
Exposure Site Oral Genital Anal
Possible Polygamous Partner Yes No
Condom Usage Always Sometimes Usually With Last Sex Exposure Never
Birth Control Method With Partners _____
Date Of Last Sexual Exposure _____
New Partner Within The Last 3 Months Yes No
Total Number Of Partners Within Last 3 Months M ___ F ___ 12 Months M ___ F ___

6. PHYSICAL ASSESSMENT

	WNL	Not Assessed	Findings
Skin			Palmar/Plantar Rash Intertrigo Molluscum Cont Scabies Rash Other
Pubic Hair			Crabs/nits Folliculitis Other
Inguinal Nodes			Enlarged Tender Bilateral Unilateral Other
Penis			Vesicles Rash Warts Hypospadias Balanitis Ulcer Other
			Discharge Amount Scant Mod Large Color Clear White Yellow Consistency Thin Thick Frothy
			Circumcised Uncircumcised
Scrotum			Pain Varicocele Hydrocele Testicular Mass Tenderness Ulcer Warts Vesicle Edema Other
Perianal area			Discharge Ulcer Vesicle(s) Fissure Warts Other
Oro-Pharynx			Ulcer Exudate Patches Other



Description Of Abnormal Findings _____
Testicular Exam Taught? Yes No

7. STAT LABORATORY

None Ordered	RESULTS		RESULTS		RESULTS
Urethral Smear	_____	Microscopy	_____	Rapid HIV Test	_____
RPR	_____	WBC	_____	TB Skin Test	_____
Darkfield	_____	Trich	_____	Other	_____

STD-39-A (R 07/08)