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Sexually Transmitted Diseases in America:

How Many Cases and at What Cost?

Prepared for the Kaiser Family Foundation by:

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Table of Contents

List of Tables and Figures

TABLES

FIGURES

EXECUTIVE SUMMARY

Sexually transmitted diseases (STDs) have a significant health and economic impact on the American people. However, the scope of the STD epidemic can be difficult to measure. The most widely quoted estimate — 12 million annual new STD infections — was published by the Centers for Disease Control and Prevention (CDC) in 1988. This report updates that estimate. A panel of experts convened by the American Social Health Association (ASHA) for the Kaiser Family Foundation calculates that the actual number of new cases of STDs is approximately 15 million annually.

Estimating how many STD cases occur is not a simple or straightforward task. First, most STDs can be "silent," causing no noticeable symptoms. These asymptomatic infections can be diagnosed only through testing. Unfortunately, routine screening programs are not widespread, and social stigma and lack of public awareness concerning STDs often inhibits frank discussion between health care providers and patients about STD risk and the need for testing. Thus, most STDs go undiagnosed.

Second, of the STDs that are diagnosed, only three — gonorrhea, syphilis, and chlamydia — are nationally reportable diseases, meaning that health care providers are required to report cases to state health departments and the CDC. There is no national reporting requirement for the other five major STDs — genital herpes, human papillomavirus (HPV), hepatitis B, HIV and trichomoniasis. Further, reporting practices differ between public and private health care sources, as well as among states and individual providers.

The ASHA panel developed a methodology for weighing the strength of available data, based on the completeness and consistency of source materials. This methodology was applied to published data using conservative assumptions to estimate the number of new cases of STDs occurring in 1996, the total number of existing infections for that year, and the direct medical costs of these cases. It was not possible to estimate the number of individuals these cases affect, as one person may contract multiple infections.

The ASHA panel estimated that 15.3 million new STD infections occurred in the United States in 1996 (see figure 1). This estimate is larger than the 12 million previously estimated, mainly because improved detection techniques have made it possible to identify asymptomatic ("silent") infections that were undercounted in the past. Most notably, the estimates for human papillomavirus (HPV) and trichomoniasis have increased sharply as a result of new detection and estimation methods and now account for two-thirds of new cases. However, similar to previous aggregate estimates of STDs, HPV and trichomoniasis estimates are based on limited data. Therefore, the panel noted that the true number of new infections could be as low as 10 million or as high as 20 million a year.

It is important to note that the panel's estimates do not reflect an increase in the STD epidemic, but rather a more accurate count. Overall, the actual number of STD cases has probably decreased slightly. Better detection methods have allowed more STDs to be treated, which interrupts the chain of STD transmission. As a result, the incidence of some bacterial STDs (chlamydia, gonorrhea and syphilis) has fallen, due in large part to national control programs. Behavioral change resulting from awareness of HIV has also had a positive impact on the spread of STDs.

In addition to new annual cases of STDs, the panel estimated the total (cumulative) number of cases in 1996 for each of the leading viral infections, herpes, HPV, hepatitis B, and HIV (see figure 2). These STDs cannot be cured, and thus cases accrue in the population year after year. In summary, the panel found the following:

Figure 1. Estimated Annual New Cases of STDs

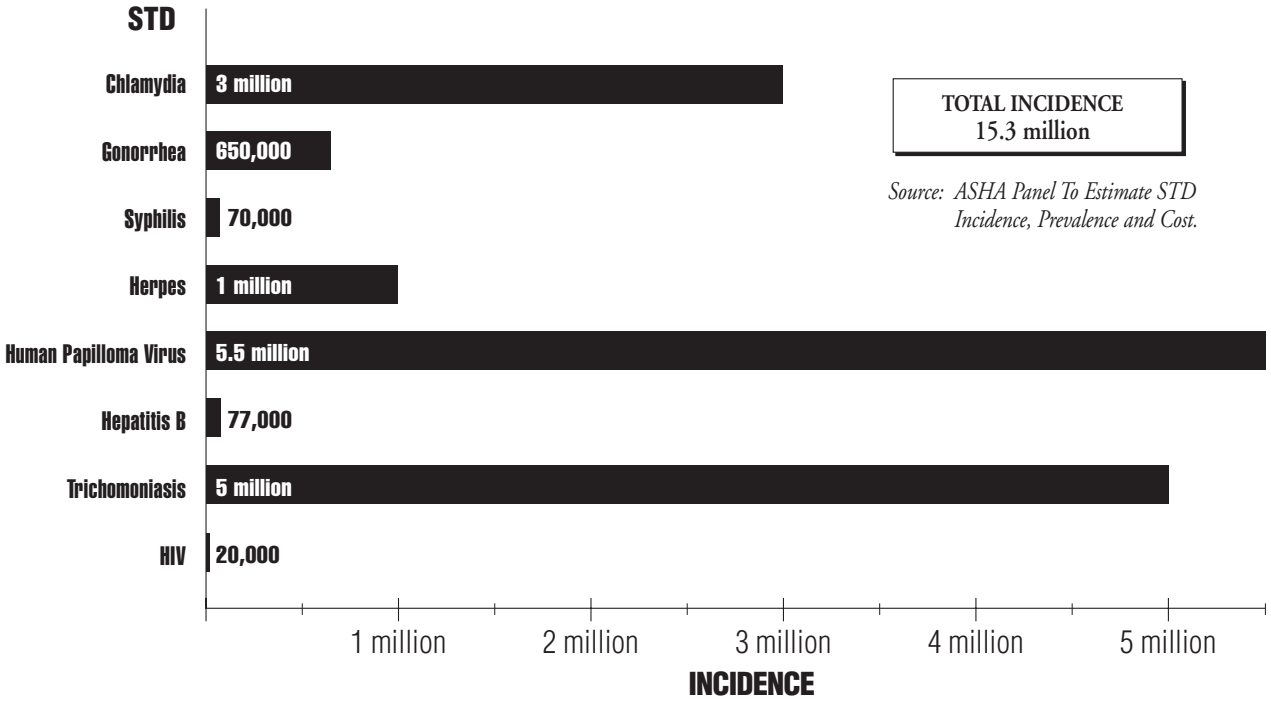
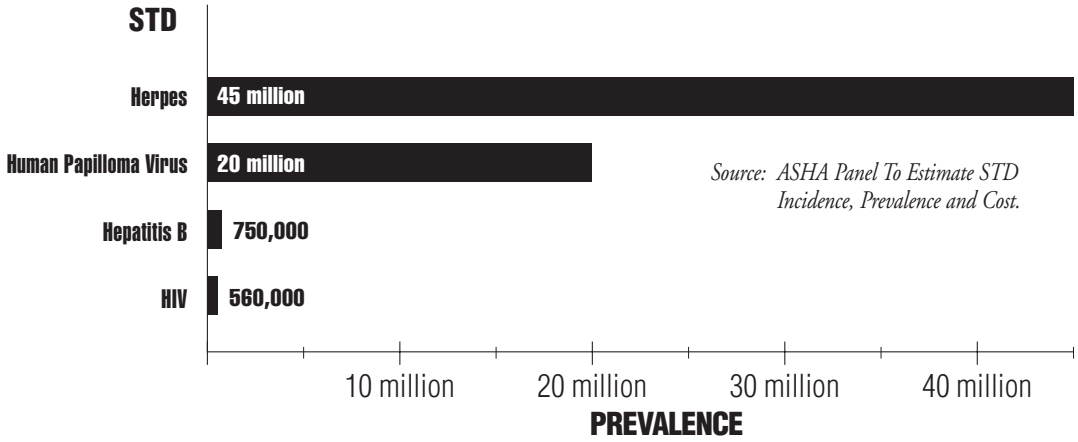


Figure 2. Total Cases of Viral STDs



Curable *(bacterial)* STDs

- **Chlamydia.** The number of new *reported* chlamydia cases has risen in recent years, but this increase is due mainly to more screening rather than more infections. Overall, as more infections have been found and cured, the number of new cases has fallen, from an estimated 4 million to about 3 million a year.
- **Gonorrhea.** New cases have continued to decline over the last two decades, from 1 million in 1977 to 650,000 in 1996. However, rates remain disproportionately high among teens and ethnic minorities.
- **Syphilis.** Rates of syphilis in the U.S. are at the lowest levels in 20 years, at 70,000 new cases annually. Infection levels are so low that the CDC, Division of STD Prevention, has concluded it is possible to eliminate syphilis in the United States.
- **Trichomoniasis.** "Trich" is the most common curable STD among young, sexually active women, with an estimated 5 million new cases a year.

Incurable *(viral)* STDs

- **Genital herpes.** This lifelong viral infection has grown by 30% in the last two decades, to at least 45 million cases. Genital herpes now affects more than 1 in 5 Americans over the age of 12. One million new cases occur each year. Most herpes infections do not cause noticeable symptoms but can still be transmitted.
- **Human Papillomavirus (HPV).** Some 5.5 million new infections occur each year, with at least 20 million people currently infected. It is not known whether HPV infections are lifelong. Cervical HPV infection has been linked with cervical cancer.
- **Hepatitis B.** Despite the availability of a vaccine, hepatitis B remains a leading STD, with 77,000 new cases a year acquired through sexual transmission. A total of 750,000 people are infected with hepatitis B as a result of sexual transmission.
- **HIV/AIDS.** The annual number of new HIV cases in the United States has been stable for several years, with about half —20,000 infections per year— of new cases acquired through sexual transmission. The majority of new cases are in ethnic minorities. About 500,000 Americans are infected with HIV as a result of sexual transmission.

The panel reviewed published data on the economic costs of individual STDs and estimated the direct medical costs of STD treatment for all estimated cases in the United States per year to be at least $8.4 billion. In addition to the economic impact of STDs, the panel noted that STDs have a high human cost in terms of pain, suffering and grief. Finally, the panel derived state-by-state estimates of STD cases and their direct medical impact by distributing the national STD burden across states according to the percentage of sexually active unmarried 15-24 year old men and women in each state.

As better data become available through the CDC and other sources, the methodology developed by the ASHA panel can be used to estimate STD cases and costs more accurately. In the meantime, the estimates in this report represent the best and most current numbers on which to base policy decisions, medical cost allocations, and public education concerning this important health issue.

ASHA PANEL TO ESTIMATE STD INCIDENCE, PREVALENCE AND COST

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INTRODUCTION

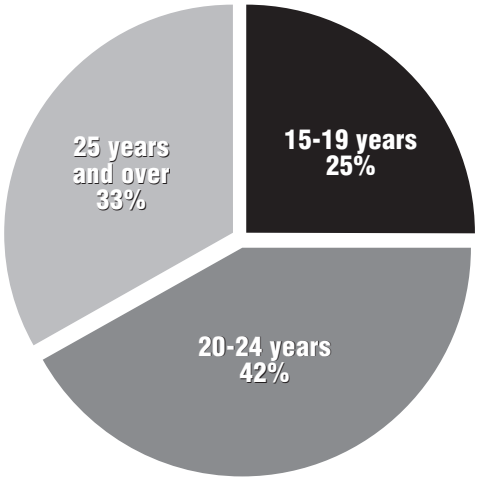
Sexually transmitted diseases (STDs) are among the most common infections in the United States. In 1996 one STD — chlamydia — was the most frequently reported infectious disease in the country, according to the Centers for Disease Control and Prevention (CDC). Of the top 10 most frequently reported infections, five are STDs. Most Americans are unaware of the extent of the STD epidemic, however, because many infections are asymptomatic, and because social stigma prevents open discussion of the topic.

The silent nature of the STD epidemic is perhaps its greatest public health threat, as people continue to underestimate their risk or forgo testing because they have no symptoms. In addition, a potentially deadly aspect of STDs is the link to HIV. STD infections increase susceptibility to acquiring HIV, the virus that causes AIDS. Clearly the continued spread of STDs is costly in terms of both health care dollars and human suffering. However, many effective treatments and prevention strategies exist that can help stop the STD epidemic if we understand who is affected and the cost-effectiveness of prevention.

Who Is Affected?

Americans of every age and every geographic, racial, cultural, socioeconomic, and religious background are affected by STDs. Infections such as herpes and HPV are so prevalent that almost everyone is at risk, and many are already infected.

Figure 3. Distribution of New Cases of STDs by Age



Source: Eng, TR, and Butler, WT, eds, The Hidden Epidemic: Confronting Sexually Transmitted Diseases, Washington, D.C.: National Academy Press, 1997.

Impact on Teens and Young Adults. More than half of teens ages 15-19 have had sex, and these teens are at high risk for STDs. About a quarter of all new cases of STDs occur in teens; two-thirds of cases occur in people ages 15-24 (see figure 3). By age 24, at least one in three sexually active people will have contracted an STD.[1] Why are young people at such great risk? They are more likely to be single, have multiple sex partners and to engage in other risky behaviors than older people. In addition, teenage girls are highly susceptible to contracting chlamydia and gonorrhea, because these diseases easily infect the immature cervix.

Impact on Women. Biologically and socially, women are more vulnerable than men to STDs. Genital infections including HIV are more easily passed from men to women than from women to men. Women are less likely to have noticeable symptoms unless complications occur. They are then more likely to experience long-term consequences such as infertility, tubal pregnancy and cervical cancer. Many women face obstacles protecting themselves from STDs: in general, women have less say than men over whether to have sex, and whether condoms are used.

Impact on Infants. Virtually every STD can be passed from a pregnant woman to her fetus or infant, often with tragic consequences. Because infants' immune systems are still developing, infections that are serious for an adult can be life-threatening for an infant. Common STD-related problems for infants include low birth weight, premature birth, conjunctivitis, pneumonia, neurologic problems, and congenital abnormalities.

Impact on Other Groups. Other groups disproportionately affected by STDs include people who are poor, lack access to health care, and are geographically isolated, including ethnic minorities, who often fall into all these groups. Within the United States, some STDs — particularly gonorrhea, chlamydia, syphilis and HIV — tend to be highest in Southern states. Overall, however, STD rates do not vary greatly by region.

What Is Being Done?

Several strategies have proven effective at lowering rates of STDs in the United States. Most notably, CDC and state and local programs for the control of chlamydia, gonorrhea and syphilis have dramatically reduced the numbers of these infections. Education and counseling programs have changed sexual behaviors in some high-risk communities. In addition, new diagnostic techniques are helping health care providers find and treat many asymptomatic infections. New, single-dose treatments are available to cure bacterial STDs and provide safe options for treating pregnant women. National media have also played a key role in educating the public about STD prevalence and risk.

The Unmet Need

Despite these advances in treatment and prevention, however, the United States continues to have the highest STD rates of any country in the industrialized world.[2] No effective national program for STD prevention exists, and state programs vary widely in funding and impact. The American public remains generally unaware of the risk for STDs and the importance of prevention and screening.

A 1998 Kaiser Family Foundation/*Glamour* magazine survey found that most men and women of reproductive age (18-44 years old) seriously underestimate how common STDs are and their personal risk for getting an STD.[3] While an estimated one in four Americans will get an STD in their lifetime,[4] the majority of men (74%) and women (69%) think the rate is one in ten Americans or fewer. Only 14 percent of all men and 8 percent of all women say they think they are at risk for STDs — and single men and women are not much more likely to feel they are at risk. Perhaps for this reason, condom use is far from consistent among many couples; two-thirds of single men and women say they do not "always" use condoms. The story is similar among teens 15-17 years: the majority of teen girls (73%) and boys (77%) think the STD rate is one in ten Americans or fewer in a lifetime. Only one in five teens say they think they are at risk of getting an STD.

The secrecy and shame surrounding STDs interfere with communication between parents and children, sexual partners, teachers and students, and even patients and health care providers. In a Gallop Organization poll commissioned by ASHA in 1995, over half of adults and over one-third of teens said their health care providers spend "no time at all" discussing STDs with them.[5] Another Kaiser Family Foundation/*Glamour* survey conducted in 1997 found that STDs are rarely discussed during OB/GYN visits, and that providers may not be asking adequate risk-assessment questions.[6] As greater numbers of Americans receive their health care through managed care organizations, it will be critical for these and other private health care providers to take the initiative in counseling, screening, diagnosing and treating patients for STDs. Teenagers, in particular, need and deserve better information, counseling and access to health care.

There is a clear need for public and private sector organizations, medical professionals, educational systems, the media, and religious and community groups to break the silence on the topic of sexual health. Public education programs are essential to alert consumers, health care providers and policy makers to the reality of the STD epidemic. The mass media can be extremely powerful in promoting healthy behaviors and balanced sexual messages.

Clearly, more progress is needed and is feasible. With the currently available testing and treatment technologies, the United States has never had better tools for addressing its large and costly STD epidemic. Effective prevention to reduce the spread of STDs now can prevent both growing health care costs and continued human suffering.

Notes and References

1. **Calculated by the ASHA panel based on the following data:**
   HPV has been shown to infect more than 40% of sexually active college students; genital herpes infects 12% of the American population by age 24; and chlamydia infects 5-10% of women ages 15-24.

2. **Eng, TR, and Butler, WT, eds,**
   The Hidden Epidemic:
   Confronting Sexually Transmitted Diseases
   Washington, D.C.:
   National Academy Press, 1997.

3. **Kaiser Family Foundation/Glamour**,
   1998 Survey of men and women on sexually transmitted diseases. Menlo Park, CA.

4. **Calculated by the Alan Guttmacher Institute (AGI) on the basis of CDC incidence data and estimates.**
   Donovan, P., Testing Positive:
   Sexually transmitted disease and the public health response.
   The Alan Guttmacher Institute, Washington, D.C., 1993.

5. **American Social Health Association/Gallop Organization**,
   Teenagers know more than adults about STDs, but STD knowledge among both groups is low.
   Research Triangle Park, NC, 1995.

6. **Kaiser Family Foundation/Glamour**,
   1997 National survey —talking about STDs with health professionals: Women's experiences. Menlo Park, CA.

ESTIMATES OF THE INCIDENCE AND PREVALENCE OF STDS IN THE UNITED STATES

Abstract

Background Accurate, updated estimates of the incidence and prevalence of sexually transmitted infections in the United States are needed. The most widely quoted number of annual new STDs is 12 million. However, this figure has not changed in more than a decade despite improvements in detection methods and the effects of STD control programs.

Goals To propose a system for assessing the strength of STD surveillance data and to estimate the incidence and prevalence of STDs in the United States for 1996, using the available published data.

Results We estimate more than 15 million incident STDs occurred in the United States in 1996. This number exceeds the earlier 12 million estimate primarily because improved detection techniques have allowed an assessment of previously undiagnosed infections.

Conclusions Large numbers of new STDs continue to occur each year in the United States, with serious health and economic consequences. More than two-thirds of our current estimate of 15 million STDs annually is contributed by two infections - trichomoniasis and HPV - for which we have only level III surveillance data. As the quality of our surveillance data improves, we can further refine the precision of our national estimates.

Introduction

Sexually transmitted diseases (STDs) remain a major public health problem in the United States (Eng & Butler, 1997). However, estimating the overall incidence and prevalence of STDs is a complex and elusive task. For the past decade, the most widely quoted figure has been 12 million sexually transmitted infections occurring annually (Gunn, 1998; ASHA, 1995). The scientific basis for this number has not been closely examined, and recent variants have been proposed. For example, for 1994, the sum of the specific STDs listed in the Institute of Medicine's report was 10.5 million new cases annually, while a 1998 NIH Program Announcement cited 14 million STDs annually (NIH, 1998).

Are 12 million cases of STDs still an accurate estimate of STDs for the United States today? Several developments suggest a readjustment is in order. Because control programs directed against gonorrhea and syphilis have enjoyed recent successes, the incidence and prevalence of these infections have declined (DSTDP 1997). Chlamydia control programs, which have emphasized increased screening, have led to a paradoxical (though predictable) situation where reported cases are increasing despite decreasing incidence and prevalence (DSTDP 1997). Also, improved detection techniques have made us aware of the unrecognized extent of genital herpes, human papillomavirus, and trichomoniasis. This review examines the available published evidence to provide an updated point estimate and range for the incidence and prevalence of selected STDs in the United States.

Measures of STDs

Estimates of the incidence and prevalence of STDs in the United States vary according to the source of data and the methods used to detect infections (Eng and Butler, 1997; St. Louis, 1997). Sources generally include 1) reportable infections (e.g. gonorrhea, syphilis and chlamydia), 2) diagnoses made during visits to office-based practices, 3) national surveys of representative populations, 4) prevalence data on individuals attending specialized health facilities (e.g. STD clinics, family planning clinics, etc.), and 5) data from multinational models of STD natural history.

Case reports for notifiable STDs for the United States are collected by the Centers for Disease Control and Prevention through formal surveillance systems based in the states (DSTDP, 1997). Reported data may vary in accuracy, depending upon the surveillance priorities of STD control programs. These data on notifiable infections tend to be more accurate in states that have laws that require reporting of positive STD tests. Other data on infections can be derived from five key sources: 1) the National Health and Nutrition Examination Survey (NHANES), conducted by the National Center for Health Statistics (NCHS), which collects clinical and biologic data on a random sample of Americans; 2) the Hospital Discharge Survey of NCHS, which includes 7,500 randomly selected hospitals from throughout the United States; 3) the National Ambulatory Medical Care Survey of NCHS, which is a probability sampling of the diagnoses of 1,900 physicians; 4) the National Hospital Ambulatory Medical Care Survey of NCHS, which is a probability sampling of visits to hospital emergency and outpatient departments; and 5) the National Disease and Therapeutic Index (NDTI), which is a private survey of a random sample of office visits to U.S. physicians in office-based practices.

Unfortunately, each of these sources has limitations. Data on reported infections are affected by differences in the completeness of reporting between public and private health care sources, as well as interstate variation. Because infections diagnosed in public facilities are reported more frequently, these data are susceptible to biases related to the characteristics of individuals who tend to use public clinics. A cascading set of circumstances must occur for STDs to be measured accurately by public health authorities. For symptomatic infections, the symptoms must be initially perceived as abnormal by the individual and must be severe enough to cause the person to seek health care. The STD must then be diagnosed and, for reportable infections, it must be communicated to appropriate health authorities by clinicians. For asymptomatic infections, screening programs must be available at health services routinely used by infected persons. Likewise, data from private clinicians' practices are often affected by the absence of diagnostic validation.

States differ markedly in the quality of their surveillance data on specific STDs. Most have ongoing systems to collect information on syphilis and gonorrhea; however, cutbacks on testing for the latter may have affected the consistency of reporting (Gershman and Rolfs, 1991). Recently, the reported number of genital chlamydial infections has been increasing, in large part because a growing array of states has made genital chlamydia a reportable infection, and wider screening has identified more cases (CDC, 1997). Finally, data from specific health facilities suffer from the problem of patient selection bias, as well as local geographic variation.

National surveys are limited by their size, sporadicity, and the superficial nature of their analytic variables. The national data bases include relatively small numbers of STDs in the samples, which lead to wide confidence intervals in subpopulations. Most national surveys are conducted years apart, which makes timely interpretation of trends difficult. Several rely on self-reports for identifying a history of previous STDs, which is limited by a respondent's inability to recognize subclinical infection and reluctance to admit a stigmatic condition. Growing use of biomarkers as measures of current (i.e. urine LCR) or past (i.e. antibodies) STD will help overcome the problem of self-reported data.

Data on specific STDs also vary by the type of infection (DSTDP, 1997), depending on whether current or cumulative infection is being measured. Symptomatic viral infections (measured by physician visits) occur less frequently than serologic or cytologic indicators of the cumulative number of infected persons. Thus, care must be used in making comparisons among the different estimates of STDs, and differences between incident and prevalent infections should be kept in mind.

Finally, the World Health Organization (WHO) has used a simple prevalence model to estimate the magnitude of curable STDs worldwide (Gerbase, 1998). First, the available information on STD prevalence from both developed and developing countries was summarized. Then, the prevalence of gonorrhea, chlamydial infection, syphilis, and trichomoniasis was estimated by gender and by United Nations region. The 1995 regional "denominator" was calculated using mid-year population estimates of adults 15-49 years of age. Next, the duration of each curable infection was estimated by gender and by region. These duration estimates were based on the probability that a symptomatic or asymptomatic person received treatment for her/his STD. Regional STD incidence in adults was then calculated by dividing the estimated prevalence by the estimated duration of each disease. Although based on broad assumptions, this WHO approach provides a standardized mechanism to make global estimates for public health purposes. It also is the best source of our estimate for trichomoniasis in the United States.

Strength of Surveillance Evidence

Several approaches have been suggested to assess the quality and reliability of the estimates for specific STDs within the United States. One is based on a characterization of the quality, generalizability, and precision of the available data (Table 1); a second has listed estimation methods by source of data (St. Louis, 1997). We have chosen to use the first approach. Even though it relies heavily on qualitative assessments of the data sources, the concept can be used to give readers an idea of the level of confidence the panel has in its estimates of the incidence and prevalence of specific STD. We have categorized the various STDs by strength of evidence according to the levels of "good," "fair," and "poor," or levels I, II and III, respectively (Table 1).

Table 1. Strength of Evidence STD Surveillance Systems

	Rating Level	Criteria	Example
I	**GOOD**	* Representative national surveys * Complete national reporting	HSV-2, AIDS
II	**FAIR**	* Widespread, consistent prevalence data from convenience samples * Consistent widespread, though incomplete national reporting	Chlamydia, HIV, HBV, Syphilis, Gonorrhea
III	**POOR**	* Inconsistent, non-representative prevalence data * Estimates based only on rough extrapolations	HPV Trichomoniasis, Chancroid, BV

Sources: Zaidi (1996), ASHA Panel to Estimate STD Incidence, Prevalence and Cost (1998)

Level I surveillance data come either from representative national surveys such as NHANES or from national reporting systems with nearly complete counts such as AIDS. Level II surveillance data are derived from composite prevalence figures obtained from multiple populations over time (e.g. for chlamydia) or from less complete national reporting systems (e.g. for gonorrhea). Finally, level III surveillance data are based on even weaker evidence and rough extrapolations (e.g. for HPV and trichomoniasis).

Epidemiology of STDs in the United States

In the United States, the incidence of reported genital chlamydial infections and viral STDs steadily increased in recent years, while the incidence of gonorrhea generally declined during the same interval. However, the actual number of chlamydial infections probably fell as control programs expanded. Levels of syphilis varied among different population subgroups, but have reached record lows since 1995. Vaginal infections such as trichomonas and bacterial vaginosis have probably remained high, although surveillance for these conditions is rudimentary.

- **Chlamydial Infections.** Genital chlamydial infections became the most prevalent bacterial STD in the United States during the 1980s, at the time gonorrhea levels began declining. In 1996, nearly 500,000 cases of genital chlamydia were reported to CDC, exceeding all other notifiable diseases in the United States (DSTDP, 1997). Reported chlamydial infections in women greatly exceed those in men, primarily because screening programs have been directed to that group. Moreover, chlamydial prevalence is strongly correlated with younger age and heterosexual behaviors. A previous estimate of 4 million new chlamydial infections annually in the United States was made more than a decade ago, using a prevalence ratio approach (Washington, 1986). Because the expansion of chlamydia control programs has probably led to declining chlamydial prevalence in the interim (DSTDP, 1997), this estimate has been updated. In 1997, between 2.6 and 3.2 million new cases of genital chlamydia were estimated to have occurred in persons aged 10-44 years (Groseclose, 1997). As a point estimate, we chose 3 million new chlamydia infections having occurred in 1996 (Table 2).

- **Gonorrhea.** Gonorrhea trends have been quite consistent ever since 1975. The number of reported gonorrhea cases has generally declined, starting in the mid-1970s with the introduction of the national gonorrhea control program. A disproportionate share of the decline occurred among older, white populations, with infection rates remaining relatively high among minority races and adolescents (Gershman and Rolfs, 1991; Webster, et. al, 1993; Fox, et. al, 1998). In addition, reported gonorrhea is associated with a younger mean age than syphilis among all gender and race categories. In 1996, CDC reported 325,900 new cases of gonorrhea (DSTDP, 1997). Because previous investigations have shown about half of all diagnosed gonorrhea cases are reported to public health authorities, an estimated total of 650,000 new gonorrhea infections occurred in 1996 (Table 2).

Table 2. Estimated Incidence and Prevalence of STDs, United States, 1996, by Strength of Evidence

STD	Incidence	Prevalence
Chlamydia	3 million -II	2 million -II
Gonorrhea	650,000 -II	
Syphilis	70,000 -II	
Herpes	1 million -II	45 million -I
Human Papilloma Virus	5.5 million -III	20 million -III
Hepatitis B	77,000 -II	750,000 -I
Trichomoniasis	5 million -III	
Bacterial Vaginosis	No Estimates	
HIV	20,000 -II	560,000 -II
TOTAL	**15.3 million**	

Source: ASHA Panel to Estimate STD Incidence, Prevalence and Cost.

NOTE: Incidence is the number of new cases in a given time period; prevalence is the total number of cases in the population.

- **Syphilis.** Syphilis trends have followed a roller coaster course for the last half-century. Its incidence rose during World War II, but fell thereafter, coinciding with the introduction of penicillin. The lowest levels were observed at the end of the 1950s, but from the 1960s on, the incidence of syphilis increased (Nakashima, 1996). A rapidly rising male-to-female ratio coincided with the spread of syphilis among men having sex with men throughout the 1970s. However, in the 1980s, indicative of the safer sexual behaviors stimulated by HIV prevention messages, syphilis cases in gay males declined precipitously (Rolfs and Nakashima, 1990). This encouraging trend was directly countered by the number of climbing syphilis cases during the late 1980s among heterosexuals of minority races, in large part fueled by the crack epidemic. Nonetheless, during the 1990s, syphilis levels again fell to numbers seen two decades earlier, leading public health authorities to entertain notions of syphilis elimination (CDC, 1998; St. Louis, 1998). In 1996, CDC reported 11,400 new cases of primary and secondary syphilis and 53,000 new cases of all stages of syphilis (DSTDP, 1997). Accounting for an estimated 20% underreporting, approximately 70,000 total syphilis infections in 1996 were estimated to have been diagnosed (Table 2).
- **Genital Herpes.** The numbers of symptomatic genital herpes cases increased eleven fold during the 1970s and 1980s (DSTDP, 1997). Genital herpes causes at least ten times more genital

ulcer cases than does syphilis. A comprehensive analysis of existing national databases estimated nearly 150,000 clinical visits for genital herpes in 1992 (Tao, 1998). Moreover, recent investigations have shown that symptomatic infections caused by herpes simplex viruses (HSV) are only the tip of the iceberg (Fleming, 1997). Infection with HSV-2 has occurred among an estimated 45 million Americans, even though less than one-quarter perceive themselves ever to have had genital herpes. Based on differences between HSV-2 levels measured cross-sectionally in the late 1970s and the late 1980s, up to 1 million new HSV-2 infections may be transmitted each year in the United States (Table 2). This number ignores the sizable percentage of genital herpes contributed by HSV-1, and thus might be considered a minimum estimate.

- **Human Papilloma Virus.** Likewise, the diagnosis of symptomatic genital warts caused by the human papilloma viruses (HPV) has been skyrocketing during the last two decades (DSTDP, 1997). Its asymptomatic counterparts, HPV infections of the cervix and vagina, have emerged as the most common STD among sexually active young populations. The cumulative three-year incidence of HPV infection among college-aged students was 43 percent, with a duration of eight months (Ho, 1998). Using conservative assumptions and extrapolating these data to the general U.S. population, one obtains an annual estimate of at least 5.5 million new HPV infections each year (Ratcliffe, 1998 - Table 2). Likewise, a conservative estimate of the prevalence of productive HPV (that is, persons with active shedding of HPV DNA) is approximately 20 million (Koutsky, 1997 - Table 2).
- **Hepatitis B.** Hepatitis B, despite the availability of a preventive vaccine, still remains among the main sexually transmitted viral infections. Approximately two-thirds of the total incident hepatitis B cases are spread sexually (Sabin, 1998). Based on CDC estimates of 128,000 overall HBV infections in the US in 1995, we count 77,000 incident sexually transmitted hepatitis B cases (Table 2). Based on serological measures from NHANES-III, an estimated total of 1,250,000 prevalent cases of chronic hepatitis B exist in the United States. Thus, we estimate a prevalence of approximately 750,000 currently infectious persons with sexually acquired HBV (Table 2).
- **Trichomoniasis.** Vaginal infections caused by *Trichomonas vaginalis* are among the most common conditions found in women attending reproductive health facilities. Between 3% and 48% of sexually active young women requesting routine care at prenatal, family planning, or college health clinics were diagnosed with trichomoniasis (Cotch, 1997). The WHO estimated that this STD accounted for nearly half of all curable infections worldwide. Based on WHO estimates for North America, we extrapolate 5 million cases of *T. vaginalis* infection annually in the U.S. (Table 2).

- **Bacterial Vaginosis.** Bacterial vaginosis, a sexually associated condition, is the most frequent cause of vaginitis in sexually active women of reproductive age (Sobel, 1997). Depending on the population studied, the prevalence of BV in the United States varies from 17% in family planning settings to 37% among selected groups of pregnant women. In the developing world, BV is even more common in the general population, affecting approximately half of all women - including those with only one reported lifetime sex partner (Wawer, 1998). The natural history of untreated BV remains a controversial research topic, although the presence of this condition has been linked to pelvic inflammatory disease and HIV acquisition. Moreover, in high prevalence areas, BV tends to recur even after mass treatment of asymptomatic women and their partners (Wawer, 1998). Because no established surveillance system exists for BV and no previous estimates of its incidence or prevalence have been made, we elected not to include this condition in the aggregate number of STDs we have derived.

- **Human Immunodeficiency Virus and AIDS.** HIV infection epidemic trends in the U.S. have been evolving. Beginning in the mid-1970s, HIV was transmitted primarily among homosexual and bisexual men, and AIDS was first diagnosed in this group by the early to mid-1980s. The virus entered the injection drug-using (IDU) populations in the early 1980s and rapidly spread during the decade. Limited heterosexual transmission occurred until the late 1980s. However, since 1989, the greatest proportionate increase of reported AIDS cases has been among heterosexuals, and this trend is expected to continue (Rosenberg, 1995). In 1993, an estimated 750,000 persons in the U.S. were infected with HIV, with approximately 40,000 new infections occurring each year (Rosenberg, 1995). By 1996, another approach to estimating HIV incidence and prevalence yielded an estimate of 41,000 new HIV infections annually, with between 700,000 to 800,000 prevalent HIV infections (Holmberg, 1996 - Table 2). The introduction of protease inhibitors may increase the number of prevalent infections by extending the life of HIV-infected people. Approximately half of the incident and three-quarters of prevalent infections were estimated to have been sexually transmitted. Thus, it appears as if the incidence of HIV has been relatively stable over the past several years (CDC, 1998). Globally, the incidence of HIV is much higher, with an estimated 5.8 million new HIV infections annually and more than 30 million persons currently living with HIV (UNAIDS, 1998). More than 90% of the global total has been spread sexually.

Conclusion

Our updated estimate of the number of STDs annually is somewhat higher than the 12 million infections estimated in 1988. The cumulative number of incident infections spread sexually is more than 15 million cases per year. However, nearly 70% of that total are contributed by two infections - trichomoniasis and HPV - for which we have only level III surveillance evidence. Thus, this point estimate is not precise; the true number could be as low as 10 million or as high as 20 million STDs annually.

A variety of explanations can account for the larger number of STDs. As diagnostic sensitivity improved through use of amplification techniques, we gained a greater understanding of the magnitude of asymptomatic HPV infections. Our update of new trichomonal infections, albeit extrapolated from WHO methods, also raised the total. Finally, use of serologic data from NHANES allowed better estimates of asymptomatic acquisition of HSV. These increases were only partially offset by decreases in the number of chlamydia, gonorrhea and syphilis infections resulting from recent successes in STD control programs.

These estimates of STD incidence and prevalence represent a snapshot in time, based on the available published data. CDC has a goal of improving the strength of evidence supporting its surveillance of each STD (St. Louis, 1997). For example, a pilot study of genital chlamydia from urine samples obtained from NHANES participants suggested reliable national prevalence estimates could be obtained (Mertz, et. al, 1998). As the methods to detect and measure the magnitude of STDs improve, so will the precision and accuracy of these estimates. Nonetheless, as both a barometer of the STD burden in the late 1990s and also a number upon which public policy can be based, the national estimate of 15 million new cases of STDs annually is a useful tool.

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ESTIMATES OF THE DIRECT MEDICAL COSTS OF STDS IN THE UNITED STATES

The ASHA panel reviewed published data on the economic costs of individual STDs and estimated the direct medical costs of STD treatment for all estimated cases per year. Direct medical costs are dollars actually spent within the health care system treating STDs and their complications. The direct costs presented here — $8.4 billion — are only one part of the total economic burden of the STD epidemic. These estimates do not include nonmedical indirect costs (lost wages and productivity due to STD-related illness), out-of-pocket costs, or the costs incurred when STDs are transmitted to infants, which can result in significant lifelong expenditures. In addition, many STD cases result in an office visit but are not diagnosed as STDs. Finally, these estimates do not include the cost of STD prevention and screening.

It is useful to look at the costs for treating bacterial and viral STDs separately, because the nature of these infections is quite different (see tables 3 and 4). Treatment of bacterial STDs most often results in a cure; the course of therapy is limited and relatively inexpensive. By far the greatest costs associated with bacterial STDs result from complications of untreated chlamydia and gonorrhea, which can lead to pelvic inflammatory disease (PID). Viral STDs, in contrast, cannot be cured and may require treatment over a period of years. The greatest costs associated with viral STDs result from treatment of precancerous cervical lesions caused by HPV infection, and treatment of sexually transmitted HIV/AIDS.

In addition to the economic impact of STDs, the panel noted that STDs have a high human cost in terms of pain, suffering and grief. Complications of chlamydia and gonorrhea can lead to chronic pain, infertility and tubal pregnancies, which can affect a woman's health and well-being throughout her lifetime. The harmful impact of STDs on infants leads to long-term emotional suffering and stress for families, which cannot be captured in dollar terms. Unlike other diseases, STDs often cause stigma and feelings of shame for patients diagnosed with these infections. According to a 1998 Kaiser Family Foundation/*Glamour* survey of adults, almost half of men (44%) and women (47%) say if they were in a new relationship and discovered their partner had an STD, they would be "a lot less likely" to continue the relationship, with another third saying they would be "somewhat less likely" (30% men, 29% women). Most say they would feel "angry" at the person they got it from if they found out they had an STD, though women (87%) are more likely than men (74%) to say so.

Table 3. Estimated Annual Medical Costs of the Major Curable STDs in the United States

STD	Total Cost[a] *($ millions)*
Chlamydia[b]	$ 374.6
Gonorrhea[c]	56.0
Pelvic inflammatory disease[d]	1,125.2
Trichomoniasis[e]	375.0
Syphilis[f]	43.8
Total costs, bacterial STDs	$1,974.6

a. All cost figures are adjusted to 1997 dollars using the Consumer Price Index, which includes medical expenses along with other consumer costs for urban consumers (approximately 87% of the U.S. population), from the U.S. Department of Labor's Bureau of Labor Statistics.

b. Source: Washington E, Johnson R, Sanders L. Chlamydia trachomatis infections in the United States: what are they costing us? JAMA 1987; 257: 2070-2, as cited in Eng TR, Butler WT, eds, The Hidden Epidemic: Confronting Sexually Transmitted Diseases, Washington, DC, National Academy Press, 1997, p 59. Note: Estimated cost is of acute infection only, and excludes treatment costs of sequelae, i.e., pelvic inflammatory disease (PID) (see below).

c. Source: Begley CE, McGill L, Smith PB. The incremental cost of screening, diagnosis and treatment of gonorrhea and chlamydia in a family planning clinic. Sexually Transmitted Diseases 1989; 16: 63-7, as cited in Eng TR, Butler WT, eds, The Hidden Epidemic: Confronting Sexually Transmitted Diseases, Washington, DC, National Academy Press, 1997, p 59. This assumes the average cost per case is $80 excluding screening costs (1994 dollars). Note: Estimated cost includes acute infection only; and excludes treatment costs of the major sequelae, i.e., PID (see below).

d. Source: Rein D, Kassler W, Rabiee L. Decreasing, but still substantial: The direct medical cost of pelvic inflammatory disease and its sequelae chronic pelvic pain, ectopic pregnancy and infertility for the year 1998 (August 1998 in press). Note: This estimate of the annual incidence of PID and its major sequelae assumes that 80% of acute PID cases are STD-related, and that 50% of ectopic pregnancies, 20% of chronic pelvic pain, and 11-30% of infertility are PID-related; a midpoint of 20% infertility is assumed in this report.

e. No reliable cost estimates are available. The cost of treatment is comparable to that for chlamydia and gonorrhea (conservatively, approximately $75 per course of treatment); if all cases are treated, the annual direct cost for treatment would be approximately $375 million.

f. Source: Chesson HW, Rein D, Kassler WJ, Irwin KL, Carande-Kulis V, Schmid GP, Pinkerton SD. Direct medical costs of syphilis in the United States: The potential for a cost-saving national elimination program. Abstract, 1998 National STD Prevention Conference, Dallas, Texas, forthcoming. This estimate is based on $1,386 per case for the 31,564 primary and secondary and early latent cases in 1996 and includes future sequelae costs for these cases. It does not include present sequelae costs of syphilis cases that occurred in the past. It does not include costs for congenital syphilis.

Table 4. Estimated Annual Medical Costs of the Major Viral STDs in the United States

STD	Total Cost[a] *($ millions)*
Genital herpes[b]	$ 208.0
HPV[c]	1,622.8
hepatitis B[d]	51.4
HIV[e]	4,540.0
Total costs, viral STDs	$6,422.2

a. All cost figures are adjusted to 1997 dollars using the Consumer Price Index, which includes medical expenses along with other consumer costs for urban consumers (approximately 87% of the U.S. population), from the U.S. Department of Labor's Bureau of Labor Statistics.

b. Source: Tao G, Kassler W, Rein D. Medical expenditures for genital herpes in the United States. Division of STD Prevention, National Center for HIV, STD and TB Prevention, Centers for Disease Control and Prevention, Atlanta, GA 30333 (in press). Costs are estimated based on genital herpes-related clinical visits and pharmacy claims.

c. Includes direct annual costs of treatment for genital warts, precancerous lesions, carcinoma in situ and cervical cancer. Genital warts: Source of data on incidence: Stone KM. Epidemiological aspects of HPV infection, Clinical Obstetrics & Gynecology 1989; 32:112-3. Source of data on costs: Kassler W. Division of STD Prevention, National Center for HIV, STD and TB Prevention, Centers for Disease Control and Prevention, Atlanta, GA 30333 ($446 per episode). Note: Annual costs assume that 75% of genital warts are treated (20-30% resolve without treatment.) Precancerous lesions, carcinoma in situ, and cervical cancer: Source of data: Preventing emerging infectious diseases: A strategy for the 21st century," Morbidity and Mortality Weekly Report 1998;47:RR-15. Note: Estimates for precancerous lesions, carcinoma in situ and cervical cancer assume that 82% of cases are attributable to HPV.

d. Source: Margolis H, Coleman P, Brown R, Mast E, Sheingold S, Arevalo J. Prevention of Hepatitis B virus transmission by immunization. JAMA 1995; 274:1201-8. Based on the data in the above report, the following assumptions were made in deriving the direct costs of treatment for acute hepatitis B infection and the major sequelae (chronic liver disease, comprising chronic active hepatitis, chronic persistent hepatitis, cirrhosis and primary hepatocellular carcinoma): Approximately 60% of initial adult/adolescent infections are asymptomatic and are assumed not to require treatment (Margolis, personal communication) and 40% of initial infections are symptomatic, of which approximately 88% require outpatient treatment estimated at $210 per case ($1993). Approximately 12% of symptomatic cases require hospitalization at $6,240 per case ($1993). Approximately 6% of adult/adolescent infections become chronic cases, of which approximately 15% develop chronic liver disease (CLD). Assuming that the four major components of CLD are equally distributed, the average cost of a case of CLD is estimated to be $45,800 ($1993). Conservatively, this lifetime cost figure can be discounted at 3% per annum assuming an average latency of onset of 20 years to $25,400. The average annual cost per case of infection is therefore approximately $668 in $1997.

e. Source: Bozzette S, Berry S, Duan N, Frankel MR, Keesey J, Lefkowitz D, Shapiro MF. Characteristics of HIV-infected patients receiving regular care in the U.S.: Results from the HIV Cost and Services Utilization Study (HCSUS). XII International Conference on AIDS. Geneva; 1998. Poster # 13229.

ESTIMATED IMPACT OF STDS STATE-BY-STATE

Comprehensive state-level data on STD incidence and cost do not exist. Therefore the ASHA panel attempted to estimate the distribution of cases for each of the 50 states using population statistics as a rough proxy. Overall, total STD rates do not vary greatly by region. For the most common STDs, HPV and trichomoniasis, no regional distribution pattern has been seen. For genital herpes, only a slight regional variation has been found, with the highest distribution of cases in the West and the lowest in the Midwest. Thus it is possible to use the percentage of sexually active unmarried men and women ages 15-24 in each state to approximate the number of new STD infections each year by state. Table 5 shows this distribution of new STD cases by state for 1996, with associated costs.

Table 5: Estimated Annual Direct Costs of All STDs by State

STATES	Estimated annual new cases of STDs	Estimated annual direct medical costs, all STDs *($ millions)*	STATES	Estimated annual new cases of STDs	Estimated annual direct medical costs, all STDs *($ millions)*
ALL USA	15,300,000	$8,396.8	MISSOURI	276,500	151.7
ALABAMA	240,700	132.1	MONTANA	51,300	28.1
ALASKA	28,300	15.6	NEBRASKA	94,700	52.0
ARIZONA	296,400	162.6	NEVADA	84,200	46.2
ARKANSAS	142,600	78.3	NEW HAMPSHIRE	58,300	32.0
CALIFORNIA	1,857,000	1,019.1	NEW JERSEY	456,500	250.5
COLORADO	267,600	146.9	NEW MEXICO	100,200	55.0
CONNECTICUT	170,900	93.8	NEW YORK	1,146,000	628.9
DELAWARE	45,400	24.9	NORTH CAROLINA	416,200	228.4
D.C.	35,800	19.6	NORTH DAKOTA	41,500	22.8
FLORIDA	719,900	395.1	OHIO	628,800	345.1
GEORGIA	476,000	261.2	OKLAHOMA	167,800	92.1
HAWAII	66,100	36.3	OREGON	201,300	110.5
IDAHO	64,400	35.4	PENNSYLVANIA	619,000	339.7
ILLINOIS	736,400	404.1	RHODE ISLAND	42,800	23.5
INDIANA	304,200	166.9	SOUTH CAROLINA	258,900	142.1
IOWA	154,800	85.0	SOUTH DAKOTA	39,900	22.0
KANSAS	149,500	82.0	TENNESSEE	266,100	146.0
KENTUCKY	208,700	114.5	TEXAS	1,127,600	618.8
LOUISIANA	291,300	159.9	UTAH	136,000	74.6
MAINE	58,300	32.0	VERMONT	35,300	19.4
MARYLAND	310,900	170.6	VIRGINIA	345,800	189.8
MASSACHUSETTS	357,700	196.3	WASHINGTON	298,700	163.9
MICHIGAN	599,400	329.0	WEST VIRGINIA	92,000	50.5
MINNESOTA	265,000	145.4	WISCONSIN	253,500	139.1
MISSISSIPPI	187,300	102.8	WYOMING	26,500	14.5

NOTES: The incidence and prevalence for each of the major STDs were described by the ASHA Panel To Estimate STD Incidence and Cost (see table 2). The estimated distribution of STDs and STD costs by state was calculated using, as a proxy, the proportion of unmarried men and women ages 15-24 who were estimated to be sexually active in 1997 (James Trussell, Office of Population Research, Princeton University). Data from the 1990 Census and the 1995 National Survey of Family Growth (females ages 15-24), the 1995 National Survey of Adolescent Males (males ages 15-19) and the 1991 National Survey of Men (males ages 20-24) were used to obtain estimates of the proportion of sexually active men and women by state in 1990; these figures were extrapolated to 1997 numbers using the March 1997 Current Population Survey.

The estimated annual direct medical cost of all STDs is derived from tables 3 and 4 ("Estimated Annual Medical Costs of the Major Curable STDs in the United States" and "Estimated Annual Medical Costs of the Major Viral STDs in the United States"). These tables give estimated direct medical costs for all annual U.S. cases of STDs in 1997 dollars. Cost figures are adjusted to 1997 dollars using the Consumer Price Index, which includes medical expenses along with other consumer costs for urban consumers (approximately 87% of the U.S. population), from the U.S. Department of Labor's Bureau of Labor Statistics.