

PAA Abstract
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Understanding High Levels of Sexually Transmitted Infections in the United States:
Do Economic and Cultural Factors Predict Having an
Undiagnosed Herpes Simplex Type 2 Infection?

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Specific Aims

In this paper I assess whether economic, cultural, demographic, and behavioral factors are associated with having an undiagnosed herpes infection in 1988-94 and 1999-2000 and whether observed relationships have changed over time. By providing insight into why it is that certain people are more or less likely to have an undiagnosed herpes infection, this study will advance understanding of why the United States (US) has higher rates of herpes, as well as other sexually transmitted infections (STI), than most other developed countries.

Background, Significance, and Research Objectives

Explanations for cross-national differences in STI rates: The US has among the highest levels of STIs in the developed world (Eng and Butler 1997). To illustrate, in the late 1990s, the gonorrhea rate among US adolescents was 74 times higher than the rate among adolescents in the Netherlands and France, 10 times higher than in Canada, and 7 times higher than in Britain. During the same period, American teens were 20 times more likely than French teens, 5 times more likely than British teens, and twice as likely as Canadian teens to have chlamydia (Alford 2003). The literature argues that two factors are primarily to blame for the US's higher STI rates: reduced access to care and cultural factors related to sex and sexual health (Eng and Butler 1997). Reduced access to care produces higher STI rates in the US as a result of three factors: lack of universal access to STI screening and treatment (due to insufficient political support for screening and treatment programs), lack of universal healthcare (related is that even for those who have health insurance, STI screening and treatment is not always covered), and greater poverty, resulting in a larger percentage of the populace that potentially cannot afford STI screening or treatment.

The cultural explanation for the US's higher STI levels holds that heightened secrecy surrounding sex and sexual health in the US leads to inadequate sex education for youths, a dearth of public discussion of sex and sexual health, denial by parents and politicians of the sexual activities of adolescents, unbalanced media representations of sex, and suppressed communication between parents and children, patients and doctors, and sexual partners. As a result, levels of knowledge about STIs and their symptoms are low, and at-risk individuals (especially adolescents) are reluctant to seek STI screening or to adopt protective behaviors such as negotiating condom use and asking sexual partners about their sexual histories. Furthermore, due to the stigma associated with STIs, individuals who suspect that they are infected are more likely to delay seeking treatment (Eng and Butler 1997, Berne and Huberman 1999, Satcher 2001).

As presented in the literature, the causal pathways linking access to healthcare and culture to elevated levels of STIs in the US imply that failure to diagnose or delayed diagnosis and treatment of STIs plays a major role. According to the argument, infected people fail to seek treatment as quickly and effectively as their counterparts in other countries because they do not recognize that they are infected (low knowledge), are less likely to be screened or identified as at risk by a physician (lack of political support for universal screening, and reluctance by physicians to discuss sexual matters), are too embarrassed to seek treatment (reluctance by patients to discuss sexual matters), or cannot afford treatment (access to care). As a result, compared to other developed countries, in the US curable STIs persist longer, incurable STIs that can be made less infectious through treatment remain infectious longer, and infected individuals, unaware of their disease status, are more likely to put others at risk. In this study, I use data from two rounds of the National Health and Nutrition Examination Survey (NHANES) to assess whether variables related to access

to healthcare and culture are related to having an undiagnosed STI, as would be expected if these factors indeed contribute to the US's higher STI rates, working through the mechanism of delayed or reduced diagnosis and treatment. Rather than look at all STIs, I focus on one particular STI, herpes simplex type 2 (HSV-2), for reasons I will enumerate shortly.

The primary measures of access to care that I use are poverty, household income, having a regular source of care, and health insurance status; because access to care is guaranteed in the US if you have the money to pay for it, I refer to these factors as economic factors. Although the NHANES data preclude tests of whether relevant cultural factors such as inhibition, guilt, knowledge, exposure to sex education, and media exposure are associated with a greater likelihood of having an undiagnosed herpes infection, they do allow me to check whether two factors related to cultural arguments, religiosity and region, are associated. I chose to look at religiosity because sexual guilt and feeling uncomfortable with one's sexuality have been shown to be associated for women with a decreased likelihood of using contraception effectively (Gerrard 1982, Gerrard 1987); these feelings have also been hypothesized to reduce the likelihood of adopting protective measures such as condom use (Eng and Butler 1997). As most religions espouse sexual conservatism, active religious involvement may lead to heightened feelings of guilt and internal conflict regarding sex, especially risky sex. I chose to focus on region because sex education curricula and political and social conservatism in matters of sex and sexual health, all of which are argued to contribute to the US's higher STI rates, have been shown to vary by region (AGI 2003).

Lastly, because crack cocaine use and various sexual behaviors have been linked to increased risk for STIs in the US, I check whether past cocaine use, age at first sex, lifetime number of sex partners, and having engaged in same-gender sex are associated with an increased likelihood of having an undiagnosed herpes infection. I also investigate whether demographic factors known to increase risk for STIs (including herpes) in the US are associated with having an undiagnosed herpes infection in order to ascertain whether there are factors other than those generally hypothesized as contributing to cross-national differences that may also play a role in accounting for the United States' unusually high STI levels.

I begin by assessing the relationships between economic, cultural, demographic, and behavioral factors and (a) reporting having been diagnosed with herpes and (b) testing positive for herpes. As such, I ask, (i) do the same factors predict both outcomes, and (ii) have observed associations changed between 1988-94 and 1999-2000? I then test the relationships between these factors and the likelihood of having an undiagnosed infection and assess whether observed associations have changed over time.

Herpes: Herpes simplex type 2 is an incurable, viral, sexually transmitted infection for which there is no cure or vaccine, although a vaccine is currently undergoing testing. Although herpes is typically experienced as an episodic infection, presenting as a painful initial eruption followed by intermittent recurrent eruptions of shorter duration, in fact it can have very diverse presentations. For example, herpes infections may be characterized by a mild initial episode followed by asymptomatic viral shedding (Koutsky et al. 1992), placing infected individuals at risk of not recognizing their disease status. In addition, asymptomatic infections are common. For patients who seek treatment, medication is available to reduce viral shedding and the frequency and severity of outbreaks. Factors found by previous studies to increase the risk of herpes infection include older age, female sex, black race or Hispanic ethnicity, less education, poverty, past cocaine use, and greater lifetime number of sex partners (Fleming et al. 1997). Herpes is believed to increase the

risk of HIV transmission and can be fatal in neonates (Shen and Thin 1992). In 1994, the estimated annual cost associated with herpes simplex virus types 1 and 2 was 237 million dollars (Eng and Butler 1997).

Herpes is among the most common STIs in both the United States and the world. Although cross-national comparisons are difficult due to data limitations, one review of existing data concluded that HSV-2 prevalence rates are higher in the US than in Western and Southern Europe, although they are comparable to or lower than rates in Northern Europe. Results also suggest that US rates are higher than rates in Canada, Australia, and New Zealand (Smith and Robinson 2002). Between 1976-1980 and 1988-94, prevalence in the US increased, especially for young whites (Fleming et al. 1997), and data on physician visits for herpes suggest that this upward trend may have continued through 2000 (CDC 2001). In the US, the incidence rate for herpes is approximately 1 million per year (ASHA 1988), corresponding to a total of 45 million people or 22% of the population infected (Fleming et al. 1997). However, only an estimated 10% of infected individuals are aware of their status (Eng and Butler 1997, Fleming et al. 1997). Although part of the explanation is asymptomatic infections, authors also have blamed poor understanding of the clinical manifestations of herpes for the discrepancy between actual and reported rates of infection (Eng and Butler 1997). In support of this hypothesis, studies of purportedly asymptomatic cases have found that individuals often fail to recognize herpes symptoms such as itching and discharge as indicating an infection (Langenberg et al. 1989). In fact, research suggests that most herpes infections are spread during periods of asymptomatic shedding by individuals unaware that they are infected (Mertz et al. 1992) or who incorrectly perceive that they are only contagious during an outbreak (AGI 2002).

In this paper, I focus on herpes to the exclusion of other STIs for three reasons. First, herpes is the only STI for which there exist high quality, nationally representative data from two points in time that include reported disease histories linked to actual antibody tests. Second, compared to other STIs, in the US herpes is fairly prevalent in the age range of interest, allowing me to obtain stable estimates. Lastly, herpes has the analytic advantage of being incurable, which is necessary to identify with certainty undiagnosed cases. In contrast, a person who is diagnosed with a curable STI and later tests positive for the same disease may have been diagnosed with a previous infection, or they may have been diagnosed with their current infection, which was not successfully treated at the time of diagnosis.

Data and Methods

The data that I use come from the NHANES III for 1988-94 and the NHANES 1999-2000. The NHANES is a complex, stratified, multistage probability-cluster survey representative of the noninstitutionalized civilian population of the US. In NHANES III, a series of questions regarding respondents' sexual histories and whether or not they had been diagnosed with herpes were asked of respondents ages 18-59. In NHANES 1999-2000, a similar series of questions was asked of respondents ages 14-59, including whether they had been diagnosed with a variety of different STIs. For respondents ages 12 and older (NHANES III) and ages 14-49 (NHANES 1999-2000), blood serum samples were collected and tested for the presence of HSV-2 antibodies using an immunodot assay specific for glycoprotein gG-2 of HSV-2 (Fleming 1997, CDC). Because access to data for younger respondents is restricted, for this study I limit the analytical sample to the age range 20-49. I also restrict the analysis to respondents who report ever having had sex. For my explanatory variables, I focus only on variables that were derived from questions asked in an identical or near-

identical fashion in the two waves. The one exception is the religiosity question, which was asked differently in the two waves. Consequently, I created a new variable coded 1 for religiously involved, 0 if not (defined by attending church at least once a week on average according to NHANES III, and receiving social support from church members according to NHANES 1999-2000). Due to the stark differences in the questions used to construct the religiosity variable, its effects must be interpreted with caution.

Analyzing men and women separately, I use logistic regression to examine the relationships between economic, cultural, demographic, and behavioral factors and my three outcome variables: having been diagnosed with a herpes infection, testing positive for herpes, and having an undiagnosed herpes infection. To test whether observed relationships differ in the two periods, I include a dummy variable for period, which I then interact with the different predictor variables. In the models testing associations with having an undiagnosed herpes infection, I restrict the sample to respondents who tested positive for HSV-2; the dependent variable is then reporting a past diagnosis for herpes. Models are estimated using maximum-likelihood estimation methods in STATA that take account of the complex sampling design of the NHANES. Weights are used to account for oversampling and survey nonresponse and to make the sample representative of the total US population.

I use a nested modeling approach to test the different categories of factors. The first model contains only demographic and behavioral variables demonstrated by other studies to be risk factors for STIs including herpes. Demographic variables included are: age, non-Hispanic black (vs. non-Hispanic white), Hispanic (vs. non-Hispanic white), urban (vs. rural), marital status, and education. Behavioral variables included are: age at first sex, lifetime number of sex partners, and ever engaged in same-gender sex. In the second model I add economic indicators in a piecemeal fashion so that the effects of each can be evaluated independently. Economic variables analyzed are a poverty indicator, household income controlling for the number of persons in the household, having a routine place to go for health advice and care, and type of health insurance (Medicare, HMO, non-HMO but private, public insurance, and no insurance) controlling for household income and number of persons in the household. In the third model I add cultural variables: religiosity and region. The fourth model includes a variable for past experience with cocaine.

Expected Results

Based on factors identified in previous studies as being risk factors for HSV-2, I expect the following to be significantly related to having been diagnosed with herpes or testing positive for herpes: race/ethnicity, lifetime number of sex partners, age, education, poverty, and cocaine use. Because STI prevalence levels, control efforts, and culture related to sex and sexual health evolve, I expect the magnitude of observed relationships to differ by period. In the absence of cultural or socio-structural influences, I would expect having an undiagnosed herpes infection to vary only by age (since older individuals have more time to recognize and seek treatment for infections typically acquired in youth) and sex (since the probability that an infection is asymptomatic varies by sex). The dominant explanations in the literature for why the US has higher levels of STIs than other countries lead me to expect that economic and cultural factors analyzed also will be associated with the likelihood of having an undiagnosed infection. To the extent that factors other than those identified by these explanations are shown to matter, such as sexual behaviors, demographic characteristics, or past cocaine use, it suggests that other factors are operating to hasten the spread of herpes, factors that may also help to explain the unusually high rates of STIs in the US.

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