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GENITAL CHLAMYDIAL INFECTION: A ROLE FOR SOCIAL SCIENTISTS

MARCIA INHORN MILLAR
Department of Anthropology, University of California, Berkeley, CA 94720, U.S.A.

Abstract—Potential sociomedical research contributions to the understanding of genital chlamydial infections are outlined in a six-part sociomedical 'checklist'. Sociomedical research focuses on human behavior and its social, economic, cultural, and psychological determinants. Thus, the author urges sociomedical researchers—primarily medical sociologists, medical anthropologists, social psychologists, and public health economists—to explore the cultural, socioeconomic, and behavioral factors contributing to the current 'epidemic' of genital chlamydial infection, a sexually transmitted disease (STD) that is found worldwide and has now supplanted gonorrhea as the most common STD in the industrialized nations. Control of this STD is particularly important because of its grave consequences for women's and maternal/child health; these include ectopic pregnancy, infertility, and neonatal morbidity. Before effective prevention and control programs can be realized, however, beliefs and behaviors surrounding such areas as sexuality, fertility, contraception, STDs, hygiene, and health care must be discerned for widely based populations in both industrialized and nonindustrialized nations.

Key words—*Chlamydia trachomatis*, sexually transmitted disease, sociomedical research, social science

INTRODUCTION

Social science investigation of the sexually transmitted diseases (STDs) has hardly begun. To date, social scientific contributions to the understanding of these so-called social diseases have focused primarily on the 'classic' STDs, particularly syphilis [1–7] and gonorrhea [8–11] and, more recently, on the STDs associated with the practices of homosexuality [12–14]. However, convincing evidence points to the worldwide—and, in some cases, epidemic—occurrences of other, equally serious STDs. Among these are genital infections caused by herpes simplex (types I and II), condyloma acuminata, *Haemophilus ducreyi*, and *Chlamydia trachomatis*. All are diseases that are transmitted sexually and may be influenced by social factors, such as number of sexual partners, use of contraceptives, sexual behavior (including sexual preference), and general health care practices.

This paper will focus on those genital infections caused by *C. trachomatis*, now the most prevalent—and one of the most damaging—of all the STDs seen in the United States [15]. After a brief overview of some of the major clinical and epidemiological ramifications of this disease, this paper will turn to the frankly pressing needs in the area of sociomedical research on genital chlamydial infections. The paper will argue that social scientists—particularly medical sociologists, medical anthropologists, social psychologists, and public health economists—have a crucial role to play in the understanding and control of this worldwide public health problem. Potential social scientific contributions are described in a six-part sociomedical 'checklist', which identifies research needs in the following areas: (1) descriptive sociomedical and epidemiological research; (2) economic assessments; (3) policy-making and planning; (4) education and training; (5) basic clinical research; and (6) immediate intervention strategies.

GENITAL CHLAMYDIAL INFECTION: THE CLINICAL PROBLEM

Genital chlamydial infection is caused by the atypical obligate intracellular microorganism, *C. trachomatis* [15]. Although classified as a bacterium, *C. trachomatis* shares features of both a virus and a bacterium [15]. Like a virus, *C. trachomatis* grows only intracellularly and is consequently difficult to culture [15]; unlike a virus, it contains both deoxyribonucleic acid (DNA) and ribonucleic acid (RNA), divides by binary fission, and has cell walls similar to those of gram-negative bacteria [15].

Clinically, *C. trachomatis* is responsible for trachoma, a blinding eye infection (serotypes A to C); genital infection similar in course to gonorrhea (serotypes D to K); and lymphogranuloma venereum, a relatively uncommon STD found primarily in tropical and subtropical climates (serotypes L-1 to L-3) [16]. In addition, serotypes D to K have been associated with an increased risk of inclusion conjunctivitis and respiratory tract infection (pneumonia, bronchiolitis, and otitis media) in neonates coming in contact with the bacterium in the mother's infected birth canal [15] (Table 1).

In men, the primary site of genital chlamydial infection (serotypes D to K) is the urethra [15, 17–19]. *C. trachomatis* causes approx. 50% of the reported cases of nongonococcal urethritis (NGU) among men in the U.S. [15], and chlamydial NGU is now estimated to be 1.4 times more common than gonococcal urethritis [20]. Furthermore, approximately half of the estimated 500,000 cases of acute epididymitis seen each year in the U.S. are caused by *C. trachomatis* [21]; this painful, serious complication of NGU may result in decreased male fertility [17, 22].

In women, *C. trachomatis* is associated with three common syndromes: (1) mucopurulent cervicitis (MPC); (2) urethral syndrome (dysuria-pyuria syn-

Table 1. Clinical spectrum of *Chlamydia trachomatis* infections* [15]

	Males
Infections‡	Urethritis
	Post-gonococcal urethritis
	Proctitis
	Conjunctivitis
	Pharyngitis (?)
	Subclinical lymphogranuloma venereum
Complications‡	Epididymitis
	Prostatitis (?)
	Reiter syndrome (?)
	Sterility (?)
	Rectal strictures†
	Females
Infections‡	Cervicitis
	Urethritis
	Proctitis
	Conjunctivitis
	Pharyngitis (?)
	Subclinical lymphogranuloma venereum
Complications‡	Salpingitis
	Endometritis
	Perihepatitis
	Ectopic pregnancy
	Infertility
	Dysplasia (?)
	Postpartum endometritis (?)
	Prematurity (?)
	Stillbirth (?)
	Neonatal death (?)
	Vulvar/rectal carcinoma† (?)
	Rectal strictures†
	Infants
Infections‡	Conjunctivitis
	Pneumonia
	Asymptomatic pharyngeal carriage
	Asymptomatic gastrointestinal tract carriage
	Otitis media (?)

*Trachoma, the leading cause of preventable blindness in the world, is also caused by *Chlamydia trachomatis*, but it has been excluded here because it is not generally sexually transmitted.
†Associated with lymphogranuloma venereum.
‡Question mark indicates that a relationship has not been firmly established.

drome); and (3) pelvic inflammatory disease (PID) [15]. Approximately two million cases of chlamydial cervicitis occur in the U.S. each year, or 2.6 times the number of cases of gonococcal cervicitis [20]. In addition, *C. trachomatis* now accounts for 20 to 40% of the one million recognized cases of PID in the U.S. each year, making it the leading cause of non-gonococcal PID [20, 23]. Many of these chlamydial infections in women go untreated, because of the 'silent' nature of the disease. Namely, the bacterium is able to exist in the human body in a latent or subclinical state, in which mucosal cells in the genital tract are infected without clinical expression of the disease [16]. Thus, as many as two-thirds of infected women (and one-fourth of infected men) are asymptomatic, creating a large reservoir of individuals who unwittingly transmit the disease to their sexual partners [15, 16, 24–28]. These asymptomatic infections pose their greatest risk to women, who may go on to develop serious and often irreversible complications. The most devastating sequelae occur once the bacterium has ascended into the upper genital tract. The major manifestations of upper genital tract infection in women include: (1) acute or chronic endometritis, the latter of which has been estimated to cause infertility in 2–9% of cases [29]; (2) acute salpingitis, or infection of the fallopian tubes, which leads to tubal infertility in as many as one-half to two-thirds of cases (independent of intrauterine device [IUD] usage) [30–40] and which increases a woman's risk of ectopic pregnancy seven- to ten-fold [23]; (3) chronic pelvic pain [25, 41]; and (4) acute perihepatitis, or the Fitz–Hugh–Curtis syndrome, once regarded as a complication of gonococcal salpingitis alone, but more recently associated with chlamydial salpingitis as well [15]. In addition, some researchers have linked *C. trachomatis* to cervical neoplasia and other cervical atypias, which appear to result from chronic, subclinical infection and inflammation of the cervical tissues by *C. trachomatis* and are more likely to occur in women who use oral contraceptives [26, 41, 42].

In pregnant women, pregnancy outcome may be adversely affected by genital chlamydial infection before and at the time of delivery. Potential complications include: (1) ectopic pregnancy, due to *C. trachomatis*-induced tubal inflammation and scarring and recently deemed an 'epidemic' in its own right in the U.S. [33, 43–47]; (2) premature labor [48, 49]; and (3) premature rupture of the membranes, leading to neonatal mortality in some cases as a result of overwhelming infection [48–50]. *C. trachomatis* may also be linked to stillbirth and spontaneous abortion [15, 48].

Neonates who come into contact with *C. trachomatis* in the mother's infected birth canal are at risk of being colonized by the bacterium [51–55]. Of all infants born to women with chlamydial cervicitis, as many as 50% will develop neonatal inclusion conjunctivitis, which can be mild or severe and can lead to blindness if left untreated, and from 3 to 18% will develop chlamydial pneumonia between one and four months of age [56].

Thus, in its various clinical manifestations, genital chlamydial infection most resembles gonorrhea. However, genital chlamydial infection differs from gonorrhea in three important aspects: (1) it is more common than gonorrhea in the U.S. and in other industrialized nations [16, 20, 24]; (2) its symptoms are usually less pronounced than those of gonorrhea and may often go unnoticed by both men and women [22]; and (3) due to the factors described in both (1) and (2) and the subsequent lack of early treatment of uncomplicated infections, it is more often associated with serious complications than is gonorrhea [22]. (As with gonorrhea, most uncomplicated genital chlamydial infections can be treated with a seven- to ten-day course of tetracycline, erythromycin, or an alternative agent [57, 58]. Treatment of complicated, late-stage infections is more difficult.)

THE CHLAMYDIA 'EPIDEMIC'

In addition to the severity of the infection itself, genital chlamydial infection poses a major public health problem because of its epidemic proportions in some areas of the world. Genital chlamydial infections are now recognized as the most common STD in the industrialized nations [20, 59–61], affecting as many as five million individuals annually in the U.S. alone [20, 62]. In 1981, the Centers for Disease Control (CDC) estimated that approx. 2.5 million cases of nongonococcal urethritis (NGU) caused by *C.*

trachomatis occurred, compared to only one million estimated cases of gonorrhea infection in men [24]. In addition, in a series of small-scale studies of women attending STD clinics in the U.S., the prevalence of endocervical chlamydial infection ranged from 19 to 33%, whereas gonococcal isolation rates ranged from 3 to 31% for the same populations and were lower than chlamydial isolation rates in all but one of seven studies [24]. Similar studies from Great Britain, where chlamydial infections are reported to public health authorities, suggest that chlamydial infections in the United Kingdom are at least twice as common as gonorrhea today [16, 24], the incidence in men having nearly doubled between 1970 and 1980 [24]. Likewise, in Scandinavia, where extensive clinical and epidemiological research on genital chlamydial infection has been conducted, several studies indicate that genital chlamydial infections are at least as common as—and probably more common than—gonorrhea [63, 64]. Thus, despite the lack of prevalence and incidence data for broadly based populations in the West (due to a lack of reporting in most countries and a tendency for researchers to utilize STD-clinic patient data), it would appear that genital chlamydial infections have now supplanted gonorrhea as the most common STD [20].

Collection of reliable epidemiological data from nonWestern countries is more difficult because of the constraints inherent in both clinical examination of patients and in the isolation of the fastidious *C. trachomatis* microorganism in tissue culture. Nevertheless, various seroepidemiological and clinical studies carried out in Africa and the Near East suggest that genital chlamydial infections are quite common there as well.

For example, a study of 172 male patients attending an STD clinic in Teheran, Iran, showed that 9% were actively infected with *C. trachomatis*, despite a history of treatment with antichlamydial drugs in many cases [65]. Many of these patients, furthermore, were suspected of having contracted chlamydial infection from Teheranian prostitutes, who, upon seroepidemiological study, showed evidence of *C. trachomatis* antibodies to genital serotypes in 94% of cases [66].

In a seroepidemiological survey of STD clinic patients in Addis Ababa, Ethiopia [67], 32% of men and 45% of women had antibodies to *C. trachomatis* serotypes D to K, a rate of exposure higher than that found in most studies conducted in Europe. Furthermore, in this study, women were found to be at risk of contracting genital chlamydial infection at the age of 14 years or younger, probably as a result of 'social factors', including informal marriage contracts and the extensive prostitution found in Addis Ababa.

Similarly, in a seroepidemiological study of patients attending either an STD clinic, a family planning clinic, or an antenatal clinic in Ibadan, Nigeria, high exposure rates to *C. trachomatis* were detected, particularly among asymptomatic women attending the family planning clinic (35% rate of exposure) [68]. Likewise, among Ghanaian women attending a gynecology clinic or admitted to a postpartum ward in Accra, active genital infections with *C. trachomatis* were more common than infections with *Neisseria gonorrhoeae*, and *C. trachomatis* was found to be an important cause of PID, presumably leading to infertility in some cases [69].

In two studies of infertile African women, one from Johannesburg, South Africa [70], and the other from Banjul, Gambia [71], serological studies demonstrated a high prevalence of antibodies to genital chlamydial serotypes in women presenting with infertility due to tubal pathology. In the South African study [70], the prevalence of antibody to *C. trachomatis* in women with tubal pathology was 87%, compared with only 38% in pregnant controls, as indicated by microimmunofluorescence. In the Gambian study [71], in which antibodies to both *C. trachomatis* and *N. gonorrhoeae* were identified, 89% of infertile women had antibodies to either chlamydial or gonococcal antigens, or both, compared with 46% of the matched, pregnant controls, as determined by enzyme-linked immunosorbent assay (ELISA).

Finally, in Khartoum, Sudan, the prevalence of antibodies to *C. trachomatis* serotypes D to K was relatively low—4.4% in men and 10.4% in women—in patients presenting to an STD clinic [72]. However, the authors note that, because antichlamydial drugs are freely available without prescription in Khartoum, prophylactic self-medication may play a part in the low prevalence of chlamydial infections in this population.

SOCIOMEDICAL CONSIDERATIONS

Few of the studies of genital chlamydial infection have been sociomedical in nature. Dunn [73–75] uses the term 'sociomedical' to encompass those aspects of medical research and service that are focused on human behavior and its social, economic, cultural, and psychological determinants. In the existing literature on genital chlamydial infection in the U.S., mention of these sociomedical variables tends to be anecdotal and impressionistic in nature or based upon epidemiological data from studies carried out in inner-city, public STD or prenatal clinics or in student health services—hence, representative of only small segments of the total population. As a result, the female patient at 'high risk' for genital chlamydial infection has been characterized as a young, unmarried, black or other minority woman, of low socioeconomic status, with few years of formal schooling and with repeated sexually transmitted infections as a result of sexual activity with multiple partners from a very early age. Interestingly, the 'typical' male patient differs in profile: namely, a white, middle-class heterosexual, who is probably employed or seeking higher education and is slightly less active sexually than his lower socioeconomic counterpart with gonococcal NGU. To reiterate, these stereotypical composites are not surprising if one considers that the majority of studies of chlamydial infection in women in the U.S. have been conducted in public STD or urban prenatal clinics, whereas most studies of NGU in male patients have been conducted in university student health service settings.

Several recent studies have challenged the demographic confines of earlier reports. For example, in a study of 366 sexually active adolescent girls (aged

13–21 years), Shafer *et al.* [76] showed that, despite significantly higher rates of endocervical chlamydial infection among blacks (23.3%), *C. trachomatis* was a common cause of sexually transmitted infection in both hispanic (14.3%) and white (10.3%) adolescent girls. Furthermore, in a study by Washington *et al.* [77], rising PID rates (both gonococcal and chlamydial) among the 15–19-year age group during the period from 1972 to 1981 appeared to be primarily due to increased rates of STD-induced PID among white adolescent girls, whereas rates of PID among the same cohort of nonwhite adolescents, while higher overall, declined during this period. These findings are consistent with observations by other authors [78, 79] that increases in rates of sexual experience over the past decade were more pervasive among young white women than among nonwhite women, thus placing them at risk of STDs, including chlamydial infection.

Studies of adult women in the U.S. confirm the distribution of genital chlamydial infection across class and ethnic boundaries. In studies of female college students, McCormack *et al.* [80] and Harrison *et al.* [81] showed that genital chlamydial infection occurred with some frequency among both white and black university women; as in the studies of adolescent girls, however, McCormack and his colleagues [80] found rates of infection to be much higher among black college women (20.9%) than among whites (3.1%). In studies of white middle- to upper-middle-class women, Gump *et al.* in Burlington, Vermont [33] and Jones *et al.* in Indianapolis, Indiana [82] showed that episodes of chlamydial PID occurred with some frequency in these populations. Furthermore, in their study of hospitalizations for PID (both gonococcal and nongonococcal), Washington *et al.* [45] noted that, despite higher rates of hospitalization for PID among nonwhite women, striking increases in hospitalization rates for PID among white women had occurred in the years 1975 to 1981.

Although epidemiological studies such as these have begun to identify high-risk populations in the U.S., studies of the behavioral and cultural factors that place individuals at risk of sexually transmitted chlamydial infections are urgently needed—in the industrialized as well as the nonindustrialized nations. As Judson [62, p. 271] notes:

> The sexual behavior of a defined population is clearly a primary determinant of most STD rates. Beyond this simplistic association, few 'hard' data exist. It is not just the number of different partners in the past month or year that determines the risk of infection but rather the 'risk quality' of each encounter. That, in turn, depends upon the use of barrier contraceptives, prophylactic spermicides and antibiotics; the type and duration of exposure; and many other factors that influence whether the sexual partner is likely to be a source of infection.

To date, very little research on the association between beliefs and behaviors and STDs has taken place—despite the recognition by a number of investigators [16, 22, 44, 45, 83–85] that behavioral modification (be it reduction of the number of sexual partners, use of different forms of birth control, or postponement of teenage sexual activity to early adulthood, for example) is essential to the primary prevention of STDs, including genital chlamydial infection. Undeniably, studies of sexual behavior are difficult to carry out, because of the sensitivity of the subject matter, fears about confidentiality on the part of participants, and the impossibility of verifying reported sexual behavior. For example, investigators [82] working with pregnant American Indian (primarily Navajo) women—who demonstrated high rates of chlamydial and other sexually transmitted genital infections—were reluctant to ask questions about sexual history, including sexual activities and practices, because, in their words, "in the American Indian culture such questions are considered improper" [86, p. 185].

Nevertheless, researchers working in the U.S. with other populations of sexually active men and women have been able to identify behavioral factors and cultural attitudes toward sexuality that may place individuals at risk for STDs, including genital chlamydial infections. For example, in interviews with both American and foreign-born black women attending an ambulatory gynecology clinic in the Southeastern U.S. because of acute salpingitis, Weidman [87], a medical anthropologist, showed that these patients saw no relation between "pus tubes" (their term for acute salpingitis) and sexual activity *per se*, and that frequent recurrence of the problem was regarded as failure by health care providers to "pull the poison out" properly.

In a recent case-control study attempting to identify male influences on cervical cancer risk in low-income hispanic migrant couples to California, Zunzunegui *et al.* [88] found that a husband's sexual history—primarily his number of past sexual partners (including prostitutes)—was significantly related to a wife's cervical cancer risk in couples in which the wife was at otherwise low risk for this sexually transmitted disease. Through in-depth interviews (conducted in Spanish) with both husbands and wives, researchers were able to discern marked differences in sexual history among case and control husbands. Namely, case husbands had had more lifetime sexual partners (≥ 20) than control husbands, and case husbands had tended to visit prostitutes more often than control husbands during periods of their lives when they were single. Thus, as the authors [88] note, the cultural ideal of premarital female virginity upheld in most areas of Latin America and the resultant behavioral pattern characterized by frequent use of prostitutes among young unmarried men may be the primary determinant of cervical cancer risk for this group of married hispanic women. Prostitutes, furthermore, may serve as a major reservoir of infection, by passing the carcinogenic agent to their male clients, who, in turn, secondarily infect their wives [88].

Indeed, numerous studies [8–10, 89–95] pointing to the role of prostitutes in the transmission of STDs have been carried out in the nonindustrialized countries. Most of these studies come from sub-Saharan Africa, where researchers sensitive to sociocultural and economic factors [8–10, 89–91] have identified a 'typical' pattern of transmission as follows: rapid modernization, urbanization, political upheaval, unemployment, and lack of economic opportunities in rural, tribal areas cause young men to migrate to the cities, where they make up the clientele of prostitutes, operating primarily from bars, brothels, dance-halls,

and the street. These prostitutes, who face the same economic pressures as the males and hence are mostly young (aged 15–30), rural-born, uneducated, otherwise unemployed, unmarried (often as a result of abandonment by nonreturning migrant husbands), and extremely mobile women, constitute the major reservoir of sexually transmitted infection. They transmit the infections to their unattached male clientele, who, upon accumulating sufficient wealth in the city, may return to their natal towns and villages to become reunited with their wives and families (on a permanent or temporary basis) or to marry. There, they infect their regular sex partners, primarily their wives, many of whom are rendered infertile as a result of STD-induced tubal pathology.

For example, in one remote, rural town in the Teso District of Uganda, researchers [10] found the highest rates of gonorrhea among older ($\geq$30 years) polygamous males, many of whom were returned migrants, and their youngest wives (who, as a class of women, were in oversupply because of the outmigration of young, working-age males). According to the authors, having many wives and children is a sign of health and wealth and a source of prestige among males in this community. But, as the authors note, the infected polygamous males pass their infections to their wives, who, as a result of gonococcal PID and subsequent tubal damage, may be unable to bear children; hence, the male must acquire more wives in order to produce progeny. Polygamy, then, increases the prevalence of gonorrhea in the community, thus lowering fertility and further encouraging polygamy "in a chain of circular causality" [10, p. 592]. In addition, a number of other indigenous beliefs and practices serve to facilitate the spread of gonorrhea in this community, according to the authors. These include the practice of inheriting the wives of a deceased brother or father (hence, the high rate of gonorrhea among women aged 40–49); the social more which permits married women to have extramarital sexual relations; the belief that a woman cannot become pregnant if she has gonorrhea (hence, the high rate of untreated gonorrhea among pregnant women); and the long postpartum sex taboo (typically 18–24 months), which encourages married men to seek sexual satisfaction from women other than their wives.

A similar triad of migration, prostitution, and STD has been identified elsewhere in the nonindustrialized world [92–96]. In Papua New Guinea, for example, accompaniment of male migrants by their family members to Port Moresby has resulted in the development of squatter settlements and the active prostitution of uneducated highland women by their husbands and brothers [95]. These women, along with a more 'sophisticated' class of coastal, bar-working prostitutes, are the primary source of STD for both male civilian immigrants and army personnel in Port Moresby. In Bangladesh, where nearly one-third of the population was forced to resettle during the political upheaval of 1971–72, single women who were widowed or abandoned by their families during the period of migration and war have formed the bulk of recruits to prostitution and the primary reservoir for STDs, primarily gonorrhea and syphilis, in that country [94].

Although prostitutes still play an important role in the spread of sexually transmitted diseases, including *C. trachomatis* infection, in the United States [97–99] and Europe [97, 100–103], they no longer constitute a major reservoir of infection, especially among adolescents, who, as previously described, have high rates of STDs, primarily genital chlamydial infections. Behavioral research (both interview and survey research) conducted among adolescents in the U.S. points to additional factors. In a recent special issue of the *Journal of Adolescent Health Care* (Vol. 6, pp. 257–328, 1985) on adolescents and STDs, O'Reilly and Aral [79] reviewed longitudinal survey data from the last 15 years to discern behavioral trends responsible for increasing rates of STDs among adolescents in the U.S. Factors that were deemed significant included the general increase in nonmarital sexual experience among adolescents as a result of changing social mores; number of sexual partners; use (or disuse) of contraceptives; and teenage prostitution.

Unfortunately, the behavioral research that is beginning to take place among adolescents and male homosexuals in the U.S. with regard to STDs is the exception to the rule. More behavioral studies in broadly based populations must be carried out before reliable correlations between behavior and disease can be made. Sociomedical researchers must identify cultural attitudes toward sexuality, fertility, and birth control that place some individuals at high risk for genital chlamydial infections, as well as attitudes toward health care provision that may prevent individuals from seeking appropriate medical intervention. Only when sexual health beliefs and practices are revealed—ideally though the sociomedical research strategies of in-depth interviewing and questionnaire evaluation—will public health officials be able to fashion effective prevention and control programs for genital chlamydial infections, as well as other STDs.

Likewise, additional descriptive and analytical epidemiological studies must be conducted; diagnostic tests and treatment regimens must be developed and standardized; cost-benefit analyses must be undertaken; and physician and public awareness of this relatively unknown STD must be increased through nonstigmatizing, educational campaigns. Until these needs are met, it is futile to envision or implement realistic, cost-effective prevention and control programs for genital chlamydial infection. Obviously, the time is ripe for sociomedical contributions to the understanding of this overlooked STD.

NEEDS IN RESEARCH AND INTERVENTION

With such significant gaps in our knowledge about genital chlamydial infection, the needs in terms of research and intervention are great. Many of these needs have been identified by other authors (see, for example [15, 16, 22–24, 26, 27, 36, 43, 44, 57, 104–111]). However, many have not, and none of them have as yet been carefully examined beyond a national level. For the sake of clarity and convenience, these needs have been organized into six categories: (1) descriptive sociomedical and epidemiological research; (2) economic assessments; (3)

Table 2. Checklist of potential contributions by social scientists to the understanding of genital chlamydial infection

1. Descriptive sociomedical and epidemiological research
   - 1.1. Collection of prevalence and incidence data within various cultural settings; identification of high-risk groups
   - 1.2. Establishment of behavioural factors contributing to the transmission of *C. trachomatis*
   - 1.3. Discernment of attitudes toward sexuality, fertility, contraception, sexually transmitted disease (STD), and general health care that place individuals at risk for genital chlamydial infections
   - 1.4. Studies of psychosocial consequences of genital chlamydial infection
2. Economic assessments
   - 2.1. Assessment of economic costs of genital chlamydial infection and its complications
   - 2.2. Analyses of cost–benefit ratios, which compare costs of preventive measures with those of treatment
   - 2.3. Establishment of costs of future research, physician and public education programs, and epidemiological control programs
3. Policy-making and planning
   - 3.1. Identification and recruitment of health-care planners in countries where genital chlamydial infection is epidemic; provision of locally generated cost–benefit analyses to these individuals
   - 3.2. Establishment of facilities for the diagnosis and treatment of STDs, including genital chlamydial infections, in all countries
   - 3.3. Assessment and/or implementation of national surveillance systems for genital chlamydial infections
4. Education and training
   - 4.1. Education of medical personnel about genital chlamydial infection; sociomedical assessment of methods of information dissemination
   - 4.2. Development of public education programs about genital chlamydial infection that do not generate additional STD fear and stigma
   - 4.3. Education of family planners and their clinic clientele about protective effects of barrier methods of contraception and potentially sterilizing effects of genital chlamydial infection
5. Basic clinical research
   - 5.1. Development of diagnostic tests; sociomedical input into conditions under which these tests will be utilized
   - 5.2. Establishment of optimal, culturally acceptable treatment regimens
   - 5.3. Research to further elucidate role of *C. trachomatis* in infertility and poor pregnancy outcome
6. Immediate intervention strategies
   - 6.1. Identification of sexual contacts of known cases of genital chlamydial infection; cost–benefit assessment of full-time contact tracing
   - 6.2. Epidemiological treatment of exposed individuals
   - 6.3. Routine treatment of all cases of gonorrhea with concomitant antichlamydial therapy
   - 6.4. Routine chlamydial screening of high-risk individuals
   - 6.5. Routine chlamydial screening late in pregnancy for high-risk women
   - 6.6. Routine cytological screening for women at risk of cervical neoplasia from previous genital chlamydial infection
   - 6.7. Hospitalization of women with chlamydial PID to ensure compliance with antimicrobial regimens (and, possibly, prevention of subsequent complications)

policy-making and planning; (4) education and training; (5) basic clinical research; and (6) immediate intervention strategies. It is hoped that this checklist can serve as a starting point for assessing potential sociomedical contributions to research on this important communicable disease (Table 2).

1. *Descriptive sociomedical and epidemiological research*

1.1. The prevalence and incidence of chlamydial infection and its sequelae in different populations within various cultural settings around the world must be established through both descriptive and analytical epidemiological research; the aim is to identify high-risk groups most in need of prevention programs. Such studies must account for *all* at-risk groups within a given society—not just prostitutes, 'welfare mothers', those seeking voluntary abortion, or other stigmatized groups, as has often been the case in the past.

1.2. Studies must be conducted to establish which factors of sexual behavior influence the transmission of *C. trachomatis*. Such factors as personal hygiene, frequency of sexual intercourse, time of intercourse during the menstrual cycle, use of different forms of contraception, number of sexual partners, practices of orogenital and anal sex, homosexuality, and other aspects of sexual history must be taken into consideration. Sociomedical researchers—ideally medical anthropologists—must be part of the multidisciplinary research team when broaching areas of a most intimate, often culture-specific, and potentially stigmatized nature.

1.3. Attitudes toward sexuality, fertility, contraception, and, most important, toward sexually transmitted disease must be discerned in the populations under investigation. Whereas health care professionals may view STDs as the negative outcome of frequent sexual encounters with numerous partners, patients of different ethnic and cultural backgrounds may, in fact, view frequent sexual activity with numerous partners as both desirable and necessary for good health, and sexually transmitted infection may be viewed quite neutrally. Obviously, contemporary, cross-cultural investigations of attitudes toward sexuality and sexual behavior are greatly needed before effective STD prevention and control programs can be designed.

1.4. Studies of the psychosocial consequences of genital chlamydial infection must be undertaken. Anthropologists must work with psychologists to explore such psychosocial issues as informing sexual partner(s) of the potential transmission of chlamydial infection, as well as individual measures of well-being and self-esteem in light of the tragic personal consequences of chlamydial infection (including infertility and neonatal morbidity).

2. *Economic assessments*

2.1. The economic consequences of genital chlamydial infection—including the costs of diagnosis, treatment, and screening, the costs of hospitalization for salpingitis, ectopic pregnancy, and other pregnancy-related events (including neonatal infection), and the impact of disease (primarily PID) on labor force productivity—must be assessed. Current estimates [112] place the direct and indirect costs of chlamydial infections at $1.4 billion annually in the

U.S. alone, with chlamydial infections in women accounting for 79% of this cost. If the current rate of genital chlamydial infection persists, the projected annual cost will exceed $2.18 billion by 1990 [112]. Economic costs for nonU.S. populations with high rates of chlamydial infection must also be assessed.

2.2. Cost–benefit analyses must be undertaken to compare the costs of preventive measures—such as empiric therapy in patients at high risk for chlamydial infections [113], combination therapy in patients with culture-proven gonococcal infection [114], or screening of all family planning clinic clientele for *C. trachomatis* [115]—with the mounting costs of treatment [112].

2.3. The cost of providing funding, personnel, and logistic support for future chlamydial research, for education of medical personnel and the public, and for epidemiological control programs (similar to those now established in many countries for gonorrhea and syphilis) must be established. Sociomedical researchers, working perhaps through the World Health Organization's Viral Diseases Programme [116] (which is also responsible for chlamydial and rickettsial diseases), must be able to make well-educated recommendations on resource allocation for areas of the world in greatest need of intervention.

3. *Policy-making and planning*

3.1. Interested health-care planners in countries where genital chlamydial infection is epidemic must be identified and recruited for participation in regional and national prevention and control programs. They must be convinced, through the provision of locally generated cost–benefit analyses, of the importance of preventive strategies in the control of genital chlamydial infection.

3.2. Facilities for the diagnosis and treatment of all STDs—including those caused by *C. trachomatis*—must be established by health-care administrators to meet the needs of every individual in every nation. At present, diagnostic and treatment services for genital chlamydial infection are not widely available in any country [15, 16], or, for that matter, in many STD clinics around the world [108].

3.3. The advantages and disadvantages of implementing national surveillance systems for genital chlamydial infections must be addressed. Sociomedical researchers must work with epidemiologists and public health officials to assess the costs, personnel, and logistics required to implement reporting programs and to determine whether this knowledge is necessary for prevention and control.

4. *Education and training*

4.1. Medical professionals of all types must be educated about *C. trachomatis* and its role in genital tract infection, tubal infertility, and poor pregnancy outcome. Unfortunately, many clinicians still regard *C. trachomatis* as an esoteric subject for laboratory research and of little clinical significance [15, 80], when, in fact, their patients may be at risk for serious sequelae from genital chlamydial infection. Sociomedical researchers must address how to disseminate information about *C. trachomatis* most effectively to the medical profession and to ensure that new knowledge is transferred in an efficient and cost-effective manner. Incorporation of information about *C. trachomatis* into medical education and training programs at all levels should be considered.

4.2. The public must be educated about genital chlamydial infection without generating panic and stigma, as has been the case with genital herpes [117, 118] and acquired immunodeficiency syndrome (AIDS) [12, 118]. Paradoxically, because *C. trachomatis* has not yet been 'popularized'—hence, stigmatized—patients with this unfamiliar disease who have minimal or no symptoms may feel little, if any, motivation to seek treatment when named as a partner of an infected contact. Often, uninformed clinicians add to the patient's lack of concern by providing little or no advice on full-course therapy or what to do about sexual partners. Sociomedical researchers must work with health educators at all levels to inform the public about the risks of chlamydial infection, without generating additional STD fear and panic.

4.3. Family planners and their clinic clientele must be educated about the increased risks of genital chlamydial infection accompanying oral contraceptive usage [26, 41, 42, 44, 81, 110] and the protective effects of barrier methods of contraception (including diaphragm, diaphragm and foam, and condom) [80, 81, 83]. Women around the world must be informed of the potentially sterilizing effects of chlamydial infection as they seek methods to ensure 'safe sex'. Health educators must see to it that this message is delivered in family planning and sex education programs in both Western and nonWestern nations.

5. *Basic clinical research*

5.1. Basic laboratory research is necessary to develop affordable, sensitive, and specific diagnostic tests with which to detect genital chlamydial infection; ideally, these would provide alternatives to the cumbersome and expensive tissue-culture and the less reliable antigen detection techniques now available. Sociomedical researchers must provide input as to the conditions under which these methods will be utilized around the world, often in the absence of facilities for reliable diagnosis and treatment of infection.

5.2. Basic clinical research is necessary to establish optimum treatment regimens for genital chlamydial infection, especially for pregnant women, those with salpingitis, and for neonates born to infected mothers. When designing optimal regimens, researchers must be sensitive to cultural beliefs and attitudes regarding the use and forms of medication, so that noncompliance and treatment failures can be avoided. Sociomedical researchers must be available to elucidate these culture-specific beliefs and then to transmit this knowledge effectively to those in the clinical sciences.

5.3. Long-term clinical research must be undertaken to elucidate further the role of *C. trachomatis* in infertility and poor pregnancy outcome. Strategies to prevent and/or correct sequelae—including microsurgical tubal repair, prophylactic antibiotic regimens, and screening late in pregnancy—must be investigated.

6. *Immediate intervention strategies*

6.1. Identification and examination of sexual contacts of known cases of genital chlamydial infection are necessary to identify or exclude infection and to prevent further transmission from occurring. Sociomedical researchers and health planners must assess on a nation-by-nation basis whether contact tracing by full-time 'social officers' (as employed in Sweden [106]) is desirable, feasible, and cost-effective.

6.2. Epidemiological treatment (i.e. full therapeutic dosages of antimicrobials to individuals recently exposed to chlamydial infection, either with or without laboratory confirmation or while awaiting the results of diagnostic tests) should be considered. This strategy must be judiciously administered so as to prevent overuse and abuse of antimicrobials and resulting antibiotic resistance problems, as in the case of gonorrhea in some areas of the world.

6.3. Routine treatment of all cases of gonorrhea with concomitant antichlamydial therapy should be encouraged to cover the many cases of co-existing gonococcal and chlamydial infection [114].

6.4. Routine chlamydial screening by culture methods for high-risk individuals should be considered. Until high-risk groups are accurately identified through sociomedical and epidemiological studies in both industrialized and nonindustrialized nations, knowledgeable researchers, both medical and sociomedical, must make educated assessments as to which individuals are at greatest risk of contracting genital chlamydial infection.

6.5. Routine screening by culture methods late in pregnancy should be considered for suspected high-risk individuals. Until further studies are conducted, the same considerations mentioned in 6.4 should apply.

6.6. Routine cytological screening should be considered for women at high risk of cervical neoplasia as a result of previous chronic genital chlamydial infection.

6.7. Hospitalization of more (if not all) patients with chlamydial PID should be considered to ensure patient compliance with antimicrobial regimens and to prevent treatment failures and subsequent tubal damage. The risk–benefit ratio of mandatory hospitalization for PID patients must be assessed by teams of clinicians, hospital administrators, and sociomedical economists.

CONCLUSION

The potential contributions by social scientists to the understanding and curtailment of genital chlamydial infections are great. This paper has attempted to summarize some of these potentialities in a sociomedical 'checklist'. Certainly, there are other needs—of greater or lesser importance depending upon the area of the world under investigation, the population being studied, and the resources available. But, no matter how long the agenda, these needs must be addressed in a systematic fashion, before genital chlamydial infections—with all of their serious sequelae—loom even greater on the spectrum of worldwide public health problems.

Also, in encouraging sociomedical input into what is essentially an infectious disease problem, this paper has argued implicitly for a cooperative effort between social scientists and members of the clinical and public health disciplines. Too often, this collaboration has taken place only to 'put out brushfires', with social scientists being called upon by the biomedical community to play the role of troubleshooter—solving the mysteries of patient nonacceptance in health education or mass treatment programs gone awry in some exotic, Third World setting. More recently, some social scientists have chosen to study social, economic, and ecological factors involved in the transmission of various communicable and parasitic diseases; however, much of this work has been exclusively observational in nature, failing to take into account native interpretations of what we—but not they—would call 'infectious diseases'. Thus, these studies are limited in their utility to those who would hope to control communicable diseases through culturally specific and sensitive behavior modification and mass treatment programs.

As this paper has attempted to show, the potential interface between social science, clinical medicine, and public health in unraveling an infectious disease problem is much wider than earlier efforts may suggest. This paper has suggested contributions social scientists could make in the understanding of genital chlamydial infection, a sexually transmitted disease with important worldwide public health implications. These contributions go beyond the previous boundaries of much sociomedical research to encompass issues in epidemiology, economics, policy-making and planning, education and training, and basic clinical research and intervention. Until these contributions are made—by committed sociomedical and biomedical researchers—the dream of public health officials to control the burgeoning chlamydia 'epidemic' is hard to imagine.

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