

CHRONICLE OF A GANG STD OUTBREAK FORETOLD

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ABSTRACT

An intense outbreak of sexually transmissible diseases occurred during 1990-1991 in the socio-sexual networks of street gangs associated with the crack cocaine trade in Colorado Springs, Colorado. Described are the social science tools - street ethnography and social network analysis - applied to understand and control epidemic spread.

"He who desires but acts not, breeds pestilence."—Blake

INTRODUCTION

The year started with a bang. Two connected cases of PPNG (penicillin-resistant gonorrhea) were diagnosed in our clinic on the first working day of 1990 - an event that proved pregnant with fate. For the ensuing fifteen months, we of the STD (sexually transmissible diseases) section of the health department in Colorado Springs (1990 SMA population: 397,104) were involved in recognizing and taming an intense outbreak of STD affecting groups new to us: street gangs.

Penicillinase-Producing *Neisseria Gonorrhoeae* (PPNG) were discovered in 1976. Until 1990, local PPNG cases (0.5% of all gonorrhea cases) were typically acquired elsewhere, with subsequent local transmission a rare event. By April 1990 evidence was accumulating that endogenous transmission of PPNG was occurring, along with other STD, in the socio-sexual networks of gangs associated with the crack-cocaine trade. What follows chronicles our efforts to control this outbreak. We first summarize our current understanding of the community form of STD and then describe the social science tools - street ethnography and social network analysis - we used to understand and control transmission in local street gangs. We conclude that the forging of a public health partnership between health workers and persons affiliated with street gangs is attainable; in this instance, joint collaboration contributed not only to outbreak control but also to prevention of long-term recurrence.

We are field ("shoe-leather") epidemiologists. Our section's traditional forte has been outreach to populations empirically assessed as being at high STD risk, such as street prostitutes (Potterat, Woodhouse, Muth, Muth 1990), men who have sex with men (Potterat, Woodhouse, Rothenberg, Muth,

Darrow, Muth, Reynolds 1993), servicemen (Woodhouse, Potterat, Muth, Pratts, Rothenberg, Fogle 1985) and injecting drug users (Woodhouse, Rothenberg, Potterat, Darrow, Muth, Klovdahl et al 1994). Such populations are monitored not to point public health fingers at them, but to shake hands with them. The efficient allocation of meager STD control resources depends on interrupting chains of transmission in groups associated with intense transmission. These groups are components of specific socio-sexual networks; it is these that account for the perpetuation of STD in society. Indeed, because networks, rather than individuals, are the true ecological niche for STD, we begin with an explanation of STD ecology. This relatively new paradigm reveals the silent assumptions that guide our STD intervention approaches.

THE COMMUNITY FORM OF STD

During the last two decades, a coherent theory of STD transmission has emerged (Potterat 1992). In brief, STD survive in society by finding networks of people whose sexual and health behaviors are such that microbes find sufficient opportunity for sustained transmission. Originally termed "core groups" (Yorke, Hethcote, Nold 1978), these ecological niches are probably more accurately described as "core networks" (Potterat, Muth 1996). Core networks, though small, can be shown to account for community STD perpetuation; they are also the ultimate fountainhead of society's non-core cases. The corollary is that if core transmitters could be kept from infection, STD could not be maintained in the community.

Core network members usually report early sexual debut, high-risk and high volume sexual practices, and partner homophily (like chooses like). They frequently fail to recognize symptoms, delay seeking medical attention, fail to notify partners, fail to comply with treatment recommendations and fail to use

barrier methods to minimize STD risk. Many lack an internal locus of control. These attributes are facilitating factors for STD perpetuation.

Core networks tend to occupy discreet social and spatial boundaries. This is because people who share common values tend to socialize and live together. This preference (homophily) leads to restricted sexual and drug partner selection, and to focal patterns of residence and sites of association, usually based on age, sexual behaviors, patterns of drug use and social class. Hence, when STD are introduced, they propagate within socially and spatially focused networks ('socio-geographic space', or 'risk space' for short). Restricted partner selection is what "bends" risk space into discrete social structures.

Whether an STD survives or not in a specific social network depends on its reproductive rate (May, Anderson 1987). A microbe has to infect at least one new host (in case the original host loses the microbe or dies) simply to maintain its genetic presence. Thus the STD equilibrium point is a mean replacement rate of 1. This view predicts that a rate less than unity threatens ecologic survival, while anything greater fuels epidemic spread. Mathematically, this idea is expressed as

$$R = B \times C \times D$$

where R is the Reproductive Rate, B (Beta, or weight) is the microbe's transmission efficiency, C is the rate of partner change (Contact), and D (Duration) is the period of host infectiousness. Core networks are structures that maintain STD reproductive rates > 1. Field epidemiologists strive to induce reproductive rates below unity by reducing parameter values. Encouraging safer sex and implementing case-finding (ascertaining and treating infected cases and their exposed partners) are two major methods.

THE SOCIAL NETWORK PARADIGM

The STD contact tracing (see below) and social network paradigms can be viewed as fraternal twins: both depend on connections to make sense. Although these twin disciplines were born at the same time (early 1930s) they were raised apart, the former in the field and the latter in academia. Conceptually, they developed in parallel but used different methods and jargon (Rothenberg, Narramore 1996).

Only since the mid-1980s have these twins been reunited (Klov Dahl 1985).

A network consists of a set of 'nodes' (individuals or groups) that are connected by 'edges' (relationships). A personal network consists of a node with its connected edges and nodes, while the social network is an aggregate of personal networks. Connected network regions are 'components'. Network conformation and its properties, such as density, reachability, and prominence, can be defined mathematically (Wasserman, Faust 1994); personal-computer programs are available to assist with analyses (Borgatti, Everett, Freeman 1992). While useful, social network information is only one map. Qualitative information obtained from ethnographic observations refines the map detail, thereby providing a better view of the territory. As Rothenberg and Narramore point out:

The result is that these approaches - network ascertainment and ethnography - are complementary; together they have the potential to describe a social process, such as the transmission of disease, and to contribute to disease control and program evaluation. (1996)

In sum, we view social networks as the 'architecture' of infectious disease risk space. Just as physical space has structure, with gravity its chief architect, and just as its content (matter-energy) obeys the formula $E=mc^2$, so does risk space's structure (network conformation) influence disease propagation by obeying the formula $R = B \times C \times D$.

THE CONTACT TRACING PROCESS

Contact tracing is the practice of seeking persons exposed to serious STD; its objectives are to interrupt chains of transmission, to prevent disease complications, and to encourage safer practices (Potterat, Meheus, Gallwey 1991). It consists of the extraordinary act of asking infected persons the most intimate secrets of their lives: with whom they have sex, in what ways, and how often, and of confidentially notifying exposed partners. Health workers don't reveal the identity of informants.

If a special STD is spreading rapidly in a population, infected clients are usually asked to reveal the identity not only of their partners (contacts) but also of their partners' other partners (clusters). So-called 'cluster interviewing' not only permits more immediate access to second generation partners but, like

purposive snowball sampling, provides cues about the larger milieu (i.e., social network) in which STD is currently spreading.

OUTBREAK FORETOLD AND ACTUALIZED

Although public health authorities had issued warnings about crack cocaine use and its potential to fuel STD outbreaks - because crack appeared to "stimulate pathological levels of sexual activity" (Kerr 1989) - we were unaware that a crack subculture or its distribution system (street gangs) existed locally. By April of 1990, as a result of information obtained during STD cluster interviewing, both the presence of local gangs and of rapid STD transmission within their social networks, became evident. By the end of the outbreak in the spring of 1991, our health workers had identified more than 400 gang-associated persons, of whom 300 were medically assessed, yielding 390 STD diagnoses (for an astonishing rate of 130,000 STD cases per 100,000 population, probably the highest attack-rate ever reported) (Bethea, Muth, Potterat, Woodhouse, Muth, Spencer et al 1993).

It was one of us (RPB) who initially recognized the outbreak. Cluster interviewing and ethnographic information revealed that not only were local PPNG cases connected but that, importantly, many other STD cases (principally non-resistant gonorrhea and chlamydia) seemed to be simultaneously occurring in the same social circles. Because identifying information on contacts and clusters was often marginal, consisting of nicknames and gang hangouts, street ethnography became a central feature of our control efforts. Street ethnography consists of two parts: 'See and Be Seen'. The 'See' part occasions observations that lead to asking the right questions; the 'Be Seen' part builds trust. Although four of us performed the STD interviews and contact tracing, RPB was the principal street presence. His prior public health experience (1989, in Denver) with street gangs gave him the confidence, the vocabulary and, above all, the interest to work with our local gangs.

During the late 1980s, local gangs had staked out several places for social aggregation - specific movie theaters, hamburger stands, shopping malls, bars, public parks and apartments (for sex and to deal drugs). Because RPB, a 30-year old long-haired white male, looked like an undercover policeman, safe entry into these socio-geographic spaces

had to be mediated by gang-associated STD clients. Although gang-associated men facilitated entry, it was their women who initially supplied the most important information to identify the five different gangs and their sets; their members and respective hierarchical standing; and their sexual and business dealings. It is RPB's view that STD infection in gang-affiliated women amplified pre-existing anger these women felt vis-à-vis their male partners. Talking with RPB was one way to get back at their men for infecting them. (STD patient psychology is predictable: patients seldom think of people they might have infected; they usually angrily focus on those whom they perceive to have infected them.)

IN THE CLINIC: 'Name Dropping'

Initially armed with a partial script (gang structure and activities) and with identifying information on some actors, RPB was able to probe new STD clinic clients about gang association. Querying those who had characteristics suggestive of gang association - such as age, ethnicity, mode of dress, or presence of electronic beeper - was important in ascertaining network membership. Willingness to reveal such association was greatly facilitated by the interviewer's non-pejorative mention of gang names, gang leaders, or gang activities at opportune moments during the interview. Few gang-associated clients were voluble; although they commonly responded to our invasive questions, few volunteered information without prompting. Especially important were the moments after formal interview (when the interviewer's paper and pencil were put away) and the conversation turned casual (e.g., "Oh, by the way, what's happening with Ratso?").

Gang clients were seldom intimidated by the possibility of acquiring HIV infection by their sexual adventurism. Not until six months after the outbreak's end did HIV susceptibility become more real (because of Magic Johnson's revelation in the late Fall of 1991). In their minds, HIV risk was connected to homosexuals and injecting drug users - two groups for whom most gang kids had undisguised contempt. It was only RPB's relentless pressure that led many to acceptance of HIV counseling and testing. What they feared was PPNG. The idea of a monstrous strain of gonorrhea sufficed to scare many into periodic examination at our clinic.

In the STD Clinic, gang associates were

treated as VIP, personally attended by RPB, and afforded speedier service than non-gang clients. They were especially targeted for free condom demonstration and distribution. The clinic's receptive atmosphere promoted much goodwill in gang networks. Word of mouth referral in gang circles was a common event.

IN THE FIELD: 'Watch Your Norms'

STD workers are trained to take notes unobtrusively in the field. Even someone perceived as non-threatening, such as a health department STD worker, may be viewed with suspicion if notes are taken publicly. Notes were generally recorded immediately after completion of the field visit and away from gang spaces. Occasionally, gang-associated cars would tail RPB's car, presumably to assess RPB's destination as friendly or hostile. Once, during the initial period of street ethnography, a gang leader purposely invited RPB into an apartment loaded with dangerous material ("a mountain of cocaine, an arsenal of weapons, and explosives") presumably to test his avowed neutrality.

Since socio-sexual networks are the fundamental structures sustaining STD transmission we view them, rather than individuals, as fundamental units of intervention. And because network norms are predictive of behavior, we focused on influencing control and prevention outcomes by influencing norms. Assuming that gang leaders and opinion leaders were synonyms, RPB made special efforts to enlist the aid of top gang leaders (of whom there were about a dozen). Because such leaders can track down virtually any network member and, importantly, because they had the time, they proved invaluable in helping us locate clients with fluid domiciles.

The norms we were most interested in influencing were those that could induce the network's STD reproductive rate to levels below unity. We hypothesized that either a quantum reduction in the rate of sexual partner acquisition (Dan 1986) or even a modest level of condom use (Klov Dahl, Potterat, Woodhouse, Muth, Muth, Darrow 1992; Potterat 1993) could help metamorphosize STD transmission from sustained to sporadic. Although it appeared to RPB that the intensity of sexual activity diminished during the course of the outbreak, surrogate markers (numbers of contacts named over time) do not support this impression. And although anecdotal information obtained from men during the outbreak

suggested increased condom use over time, these reports were not often confirmed by the women. Because control of both focal and community-wide STD outbreaks have been associated with vigorous contact tracing (Potterat et al 1991), we suspect that such efforts account for much of the outbreak's abatement. Both the duration of infectiousness (D) and contact rate (C) parameters are strongly influenced by successful contact tracing (Rothenberg, Potterat 1987).

SOCIAL NETWORK ANALYSIS

We used the tools of social network analysis to retrospectively detect unapparent sexual connections, to examine network regions ('components') of intense transmission, and to identify central actors. All Program STD contact interview records (not simply those perceived to be outbreak connected) for the outbreak period were manually reviewed for evidence of gang association in the client or their named contacts or clusters. Eligibles were uniquely identified to prevent multiple counting; their sexual connections were examined using GRADAP and SAS routines.

The final data set comprised 410 (218 men, 192 women) sexually connected persons. Mean age for men was 21.5; seven-eighths were black; and 35.6 percent had known gang affiliations. The women were ethnically diverse (53% black, 31% white, 14% Hispanic) with a mean age of 19.7, and 40.6 percent had known gang affiliations (Potterat, Bethea, Muth, Woodhouse, Muth 1992). Of the 248 who ever received an STD diagnosis, 200 were interviewed, naming 558 contacts and 571 clusters ($X = 5.6$ names per client). This core network of 410 persons, representing 0.1 percent of our SMA's 18-44 year olds, accounted for a disproportionate 22 percent of all reported gonorrhea cases locally during the period of observation. As predicted (Rothenberg 1983), community STD case distribution was strongly focal geographically and exhibited a fractal pattern (Potterat 1992; Zenilman, Bonner, Sharp, Rabb, Alexander 1988). Nearly half (43%) of the 300 persons examined consented to HIV testing; one, a 31 year old white injecting drug user, was HIV-infected (Potterat et al 1992).

Analysis of the structure of sexual connections (Stepwise Graph Reduction) revealed that 107 persons were located within network regions forming a dense (cyclic) scaffold and that 303 persons were in linear (non-cyclic or

branched) regions. The 107 were much more likely than the 303 to be gang-affiliated (72.6% vs. 26%; $p < 0.001$); to be very young ($X = 19.4$ years vs. 21.1; $p = 0.002$); to be STD infected ($X = 90\%$ vs. 80%; $p = 0.03$); and to name more sexual partners ($X = 3.9$ vs 1.9; $p < 0.001$) (Potterat et al 1992). (The latter datum served as empirical support for the hypothesis that a strong motivation for young males to join gangs is enhanced sexual access to females [Palmer, Tilley 1995]).

Social network analyses confirmed our impression that the outbreak was driven by gang members; they provided strong support for the STD core networks paradigm (Yorke et al 1978); and they served to validate ethnographic impressions. For example, RPB was shown a list of the 107 cyclically connected persons and asked to select the 10 he would consider as most important to reach; there was 70 percent concordance between RPB's and the computer's picks (based on Freeman's 'Betweenness' measure of network prominence [Wasserman, Faust 1994]).

AFTERMATH AND SUMMARY

The gang-associated outbreak was principally concentrated during the 16 months separating December 1989 and March 1991. After a two month hiatus, a short-lived and much less intense resurgence occurred, lasting from July through October 1991. Knowledge gleaned from field experience and social network analysis helped us intervene quickly and put out the renascent fire. Mini-outbreaks have episodically occurred since and have been quickly addressed to prevent STD entrenchment in these core networks. Eternal vigilance comes with our territory.

Of all the epidemiologically important groups with which we've dealt during the last quarter century, none seemed as potentially dangerous as the crack cocaine-associated street gangs we describe. Although RPB recalls only one scary instance during field work (a 14 year-old 'wannabe' pulled a gun on him; RPB defused the situation by admiring the gun!), we wish to urge caution. As this anecdote suggests, sang froid may be the crucial attribute of a street-gang ethnographer; gangsters easily sense and exploit fear. It is also our impression that women ethnographers would be at special risk owing to their gender.

And yet our experience was overwhelmingly positive. As Centers For Disease Control and Prevention sociologist WW Darrow

memorably remarked: "Gang members may be alienated, but they're not aliens". The remarkable degree of trust and cooperation we enjoyed is emphasized by the extraordinarily high number of contacts and clusters they identified and helped refer to medical attention. It would be foolish to underestimate such clients' willingness, if properly approached, to collaborate in STD control endeavors.

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