

CENTER FOR ADVANCED STUDY IN THE BEHAVIORAL SCIENCES

202 Junipero Serra Boulevard • Stanford, California 94305

Telephone (415) 321-2052

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Dean George Gerbner  
Annenberg School of Communications, Arts and Sciences  
University of Pennsylvania  
Philadelphia, Pennsylvania 19104

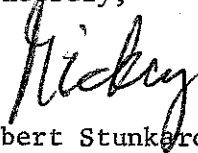
Dear George:

I very much enjoyed our dinner last month, and hope that we will have the opportunity to get together again when I return definitively from my sabbatical leave in September.

I just came across this article which I thought might interest you in terms of your notions about social climates promoting drug abuse and methods of immunizing against them. Our planning for a Regional Center for Research and Training in the Addictive Diseases has moved forward quite nicely, and I have received expressions of interest from twelve departments at Penn, as well as, *mirabile dictu*, the City Administration. Karl Rickels, a Professor in our Department, is heading up a planning group for the proposal, and I hope that you will call him or me should you have any suggestions or requests. We probably will be coming back to you in any event sometime in the fall to let you know of our progress and to ask for your suggestions.

With best wishes,

Sincerely,



Albert Stunkard, M.D.

AS: jw  
cc: Dr. Rickels

Enclosure

# A Contagious Disease Model for Researching and Intervening in Heroin Epidemics

Patrick H. Hughes, MD, and Gail A. Crawford, MA, Chicago

An epidemiologic field methodology is described for researching and intervening in urban heroin spread. Field concepts are based upon the size of the disease outbreak in definable neighborhoods: the isolated case, the microepidemic, and the macroepidemic. Field observations and Illinois Drug Abuse Program admission data are presented to illustrate the utility of these concepts. Our data suggest that heroin spreads through existing drug-using friendship groups and that "contagious" individuals tend to be in the early stages of heroin experimentation or addiction. Our approach for intervening in heroin spread is based upon established public health principles used to halt epidemics of certain contagious diseases, namely, early identification of new outbreaks and involvement of all diseased persons in treatment to prevent them from spreading the disorder to others. This intervention strategy was used to contact and involve in treatment the majority of new addicts produced by a microepidemic in one Chicago neighborhood.

Epidemiologic studies of heroin addiction in Chicago suggest that the incidence of this disorder can follow the course of certain contagious diseases, fluctuating from periods of epidemic spread to periods of relative quiescence.<sup>1,2</sup> In a previous study of a large outbreak of heroin addiction following World War II, we observed that these epidemics can have sudden onset, spread rapidly until reaching a sharp peak, and then gradually decline. After the period of epidemic spread has passed and the disorder is no longer highly "contagious," it leaves in its wake large numbers of chronic heroin addicts. At this stage the disorder becomes endemic to the urban neighborhoods involved.<sup>3,4</sup>

We also observed that the peaking and decline of heroin spread can be related to identifiable social and economic factors. For example, the decline of Chicago's post-World War II epidemic was closely associated with a sudden decrease in purity and increase in cost of heroin. The community, on the other hand, was not mobilized to take steps to control the epidemic until the peak had passed and incidence was already on the decline. Had the community launched effective public health programs in the early stages of the epidemic, spread of the disorder to additional thousands might have been prevented.

To explore the notion that heroin epidemics might be quickly contained by employing principles used to control the spread of certain contagious diseases, we developed an epidemiologic field methodology for identifying, monitor-

ing, and intervening in new outbreaks of addiction. Our field concepts are based upon the size of disease outbreaks in definable neighborhoods. More specifically, we have observed that some Chicago neighborhoods have produced 50 or more new addicts in the short span of several years—we refer to these as *macroepidemics*. In other neighborhoods we have observed that the disease outbreak appears to be contained after producing fewer than 50 new addicts, perhaps only five to 15—we refer to these as *microepidemics*. In still other neighborhoods, addiction apparently does not spread beyond one or two individuals—we refer to these as *isolated cases*. In this report we describe our research framework, some of our preliminary findings, and their implications for addiction control programs.

## Method

In the early phases of this research we concentrated on interviewing addicted subjects from a number of different communities experiencing the three patterns of spread. Having completed these pilot interviews, we entered a second, more detailed, stage of our research in which we examined macroepidemics, microepidemics, and isolated cases from three perspectives, namely, those who became addicted, those who only experimented with heroin, and those who were exposed to heroin but failed to try it. Addicted subjects were recruited from patients in the Illinois Drug Abuse Program reporting first heroin use between the years 1966 and 1971. Each addicted subject was asked to list his close friends during the year prior to his first use of heroin and to assign them to one of the three categories of heroin use: addict, experimenter, or nonuser. We then requested his assistance in obtaining interviews with friends in the experimenter and nonuser categories. When the subject designated no experimenter or nonuser in his friendship group, a second addict was interviewed to obtain an independent account of each outbreak. Subjects were paid up to \$10 for participation.

The semistructured personal interviews of addicts, experimenters, and nonusers lasted approximately two hours and were tape-recorded. They assessed a variety of social and psychological variables, such as family background, neighborhood conditions, peer group dynamics, prior drug use, and police contacts. Subjects then assisted us in constructing a heroin spread diagram similar to that developed by deAlarcon.<sup>5</sup>

At the time of this report, we had completed interviews with 43 addicts and 12 nonaddicted peers from ten macroepidemics, 13 microepidemics, and six isolated cases.

## Findings

**Distribution of Macroepidemics, Microepidemics, and Isolated Cases.**—On the basis of epidemiologic field observations, patient interviews, and Illinois Drug Abuse Program admission data, we have identified 11 macroepidemics in Chicago between the years 1967 and 1971 (Fig

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From the Department of Psychiatry, the University of Chicago, and the Illinois Drug Abuse Program, Chicago.

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Reprint requests to the Department of Psychiatry, University of Chicago, 950 E 59th St, Chicago 60637 (Dr. Hughes).

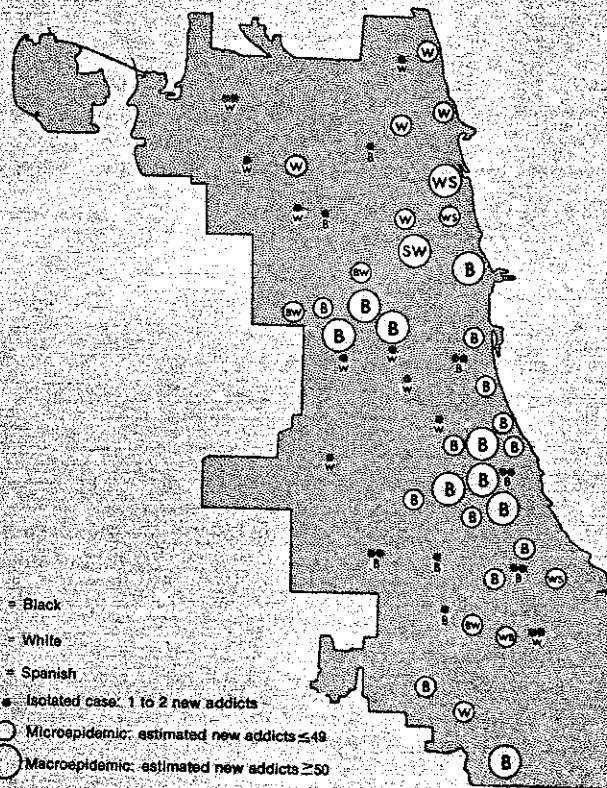


Fig 1.—Distribution of macroepidemics, microepidemics, and isolated cases in Chicago, 1967-1971.

1). The largest outbreaks continue to occur in underprivileged neighborhoods. Nine macroepidemics are in black neighborhoods and two in mixed Puerto Rican neighborhoods. In addition, we have identified 28 microepidemics: 14 in black neighborhoods, 12 in white neighborhoods and suburban areas, and two in Puerto Rican-white neighborhoods. (Outbreaks in suburban areas are not shown in Fig 1.) Although we have probably not identified all such heroin outbreaks, it would appear that many Chicago neighborhoods of similar population size produce only isolated cases of addiction or none at all.

To determine the relative proportions of new addicts involved in the three patterns of heroin spread, we administered an epidemiologic questionnaire to all addicts applying for treatment between January and October 1971 who reported first heroin use as 1967 or later (N = 365). On the basis of their community area of residence<sup>4</sup> at the time of first heroin use, we determined the proportions of subjects whose first use occurred in macroepidemic, microepidemic, and isolated case neighborhoods. We found that 204 (56%) appeared to be the products of macroepidemics, 137 (37%) the products of microepidemics, and 24 (7%) to be isolated cases. These data suggest that the majority of addicts are produced by macroepidemics that occur in a relatively small number of neighborhoods.

**Three Patterns of Urban Heroin Spread.**—We modified the approach developed by deAlarcon<sup>5</sup> to portray the spread of heroin use in a London suburb. Because he studied an isolated outbreak in a small British town, he was able to obtain incidence data on the majority of those involved and

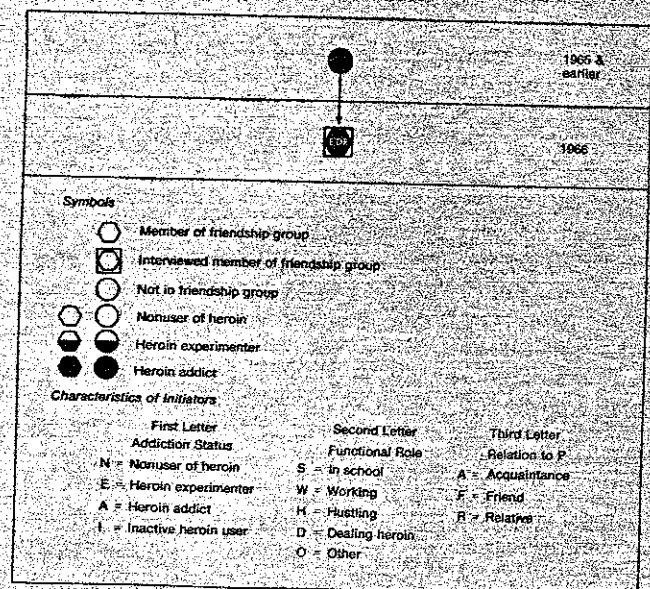
to present a comprehensive picture of the dynamics of heroin spread in that community. In contrast, we have been studying multiple outbreaks of heroin addiction in a large urban area. Although we have attempted to obtain reports from two or more individuals involved in each outbreak, our data are necessarily less complete than deAlarcon's.

Figures 2 through 4 portray examples of the three patterns of heroin spread. In this paper we do not examine these outbreaks in detail but merely point out certain aspects to demonstrate the kinds of information that can be obtained by this approach.

**An Isolated Case.**—Figure 2 shows an isolated case of heroin addiction in a white neighborhood. The arrow indicates the direction of spread, while the letters refer to the characteristics of the spreader at the time he initiated the new user to heroin. The symbols indicate the individual's eventual addiction status—ie, heroin addict, experimenter, or nonuser. For example, the isolated case shown in the figure was initiated to heroin use in 1966 by someone who was experimenting with heroin (E), was also a drug dealer (D), and a relative (R). The spreader, in this case the interviewee's sister, had been previously introduced to heroin by her boyfriend, a drug dealer who lived in a nearby neighborhood. Of the isolated cases examined to date, we find that many are initiated to heroin use by a sibling or spouse. We also note that the interviewee had no close friends at the time she first tried heroin. This is a common characteristic among isolated cases and may account for their failure to spread heroin use to others.

**A Microepidemic.**—The microepidemic shown in Fig 3 occurred over a five-year period in a middle-class white suburb. It began in 1967, while most members of the friendship group were still in high school. Their drug use started several years earlier with alcohol and marijuana, followed by barbiturates, amphetamines, and psychedelics. Prior to the introduction of heroin, then, group members were already heavy polydrug users. It is interesting

Fig 2.—An isolated case.







based upon careful analysis of the epidemiology of disease spread. In keeping with this tradition, our research has clarified several distinguishing features of the process of heroin spread which are relevant to designing an intervention strategy. First, the disorder tends to be most contagious during the early stages, i.e., it is spread by new users and the newly addicted. This suggests that new outbreaks must be identified early. If all new cases were then rapidly treated, they would no longer be contagious and further spread might be prevented. Second, the disorder is spread through person-to-person contact, and the individuals involved tend to be close friends or relatives. Third, the maintenance of a heroin habit brings new addicts into frequent association with others in the neighborhood, even though they may not have known one another prior to their addiction. These features suggest that the first case identified from a new disease outbreak might be used to lead the epidemiologist to others involved, a standard case finding principle for some contagious disorders. The feasibility of this case finding approach was suggested by a previous survey of young addicts admitted to the Illinois Drug Abuse Program (N = 365) which showed that the majority would be willing to assist the program in involving their friends in treatment. The use of known heroin addicts as case finding agents has also been demonstrated in two independent studies of narcotic addicts in England, suggesting that this technique may have widespread applicability.<sup>5,6</sup>

To test the feasibility of this intervention model, one of us (G.C.) was stationed at the Illinois Drug Abuse Program Intake Unit to screen new admissions. Our aim was to identify a microepidemic that had not yet been contained. During the first week of this project we identified several cooperative subjects from active microepidemics. We selected one of the microepidemics for intervention because of the enthusiasm and reliability of the initial contact and the proximity of the outbreak to a treatment facility. The second week of the project was devoted to identifying the individuals involved in the outbreak and to planning the intervention strategy. During the third through the sixth weeks, intensive outreach efforts were carried out. The initial contact served as fieldworker to assist in reconstructing the history of the microepidemic, in contacting other individuals involved, and in arranging for us to visit local drug distribution sites.

This microepidemic occurred in a predominantly white working-class neighborhood between the years 1965 and 1971. (The period of most rapid heroin spread was 1968 through 1970.) Members of the group began experimenting with alcohol, codeine cough syrup, and marijuana in 1966 while most were still in high school. This was followed by a period of heavy use of barbiturates and then amphetamines in 1967 and 1968. In 1967 some members of the group also began to experiment with psychedelics, and by the end of 1968 most of these young people were frequent users of lysergic acid diethylamide (LSD). Initially, group members used heroin to "bring them down" from LSD. They continued to merely experiment with heroin until early 1971, when several members established connections for copping high quality Mexican heroin. Thereafter, their drug use was confined mostly to heroin; and by

the end of summer, 1971, most had acquired heroin habits.

At the time of the outreach project, January 1972, our target group consisted of 14 active addicts and seven regular heroin experimenters. During the previous year and a half, the epidemic had produced an additional 24 addicts; however, ten of these had already entered treatment, six had left the neighborhood, and eight had either withdrawn themselves from heroin or seldom used it. These 24, and an additional group of nine occasional experimenters judged to be peripheral to this group, were excluded from our outreach efforts.

During the third through the sixth weeks of the project, we were able to involve in treatment 11 of the 14 active addicts selected for outreach. Of the three who did not respond, two are currently in jail and one has left the neighborhood. Of the seven regular experimenters selected, five were admitted to treatment, and the remaining two are reported to have discontinued their heroin use.

We concentrated our initial efforts on involving in treatment those persons responsible for copping for others. Our outreach subjects report that because they are unwilling to cop for others, heroin is no longer available in the neighborhood and use has virtually ceased among the experimenters. The outreach subjects have been converted from potential disease spreaders to a therapeutically oriented force which actively discourages heroin use in the neighborhood.

We will, of course, continue to observe this neighborhood to determine the long-term effects of this project—that is, whether we have effectively halted heroin spread. Subsequent monitoring of the area revealed a potential disease spreader in one individual who, although in treatment, continues to cop heroin for occasional experimenters who visit the neighborhood on weekends. At the time of this report, however, we had established an ongoing dialogue between our outreach subjects and clinical personnel to discuss this particular case and the need for sustained efforts to make this a heroin-free community.

During the first two weeks of this project, we were dependent upon our initial contact for a description of the nature and size of this microepidemic. During the four weeks of intensive outreach, however, we have made personal visits to the major drug distribution sites in the neighborhood and have interviewed all 16 subjects entering treatment. Their independent and convergent accounts of the microepidemic and the individuals involved make us confident of the validity of our data.

In this project we merely demonstrated the feasibility of this case finding and outreach approach in one community. Ideally, an adequate test of the model would require that we identify a sizable number of microepidemics, some of which would receive intervention with others serving as controls. The neighborhoods would then be observed for an extended period following intervention.

#### Comment

We have found deAlarcon's<sup>9</sup> method for mapping heroin spread useful in examining local incidence trends over time and in clarifying the processes of social contagion—eg, the specific interpersonal routes of heroin transmission, the characteristics of disease spreaders, and the

circumstances surrounding initiation to heroin use. Because deAlarcon's study investigated spread in a community previously free of heroin, however, it is not directly applicable to a large American urban area where heroin addiction, particularly in the ghettos, is longstanding. In this study we were not able to identify discrete epidemics with only one or two sources of contagion. Rather, there seem to be multiple sources of spread in heroin outbreaks in American urban areas.

Through interviews with the young people involved in microepidemics and macroepidemics, we found that the polydrug using friendship group serves as fertile soil for the growth of heroin addiction. While all members of these friendship groups do not become addicted, the majority usually try heroin after it has been introduced. It is important to note that these young people are not simply occasional marihuana smokers prior to the use of heroin. Rather, they tend to be heavy polydrug users who spend much of their leisure time getting high. Over time, group members develop multiple contacts with illegal drug markets, so that periodically heroin becomes accessible.

We have also been attempting to explain why some neighborhoods provide the settings for microepidemics and others for macroepidemics. Our impressions to date are that microepidemics can occur in any type of community as long as the essential ingredient, the polydrug using friendship group, is present. In this respect, they do not differ from macroepidemic neighborhoods. We note, however, that macroepidemics generally have occurred in neighborhoods that have recently undergone rapid population change, leading to a breakdown in community stability and established mechanisms of social control. In other words, not only has heroin addiction become rampant in these neighborhoods but other forms of deviance as well.

The first two macroepidemics to come to our attention occurred not in the old "dope" neighborhoods of Chicago but in previously stable black communities which recently experienced a massive influx of welfare and "multiproblem" families. This led us to hypothesize that macroepidemics were not occurring in the old dope neighborhoods because of long-established police penetration.<sup>7</sup> Although we are now seeing large outbreaks of heroin addiction in some of these neighborhoods, this does not necessarily disprove our original hypothesis. In the past few years several of these communities have been extremely hostile to local police and a number of officers have been killed. This hostility has made it difficult for narcotics agents to identify and penetrate new groups of heroin users.

While the foregoing discussion of police-community dynamics is largely impressionistic, we do have some data which bear on this issue. For example, young addicts from macroepidemic areas tend to be arrested for property crimes outside their own neighborhoods, while young addicts from microepidemic areas tend to be arrested for drug offenses within their community of residence. This finding supports the notion that aggressive narcotics law enforcement is possible in the more stable neighborhoods and may be an important factor in limiting the size of these outbreaks.

In this paper we frequently use the terms "contagious disease, macroepidemic and microepidemic" which we borrowed from public health epidemiology. We recognize, however, a number of limitations in our use of these concepts. For example, heroin is a chemical substance and not a bacteria or virus. Furthermore, initial use of heroin is a deliberate act, which is rarely the case in the transmission of infectious diseases.

We also recognize problems in our use of the terms "macroepidemic and microepidemic neighborhoods." We have defined a macroepidemic as consisting of 50 or more new addicts in a given community area<sup>8</sup> during a five-year period. Our decision to use 50 as the cut-off point is in many ways arbitrary. Similarly, our decision to use community areas was largely a matter of convenience, for we realize that Chicago's 76 community areas are not of equal population size. Although these definitional problems must eventually be resolved, at this stage of our research we are concerned with identifying gross neighborhood patterns of heroin abuse and not with developing precise measures for testing specific hypotheses.

Finally, it should be noted that our use of the term "friendship group" is not intended in any strict sociological sense. In our interviews, a friendship group was initially defined by the addicted subject, who was asked to list his close friends during the year prior to his first use of heroin. In interviewing nonaddicted members of his friendship group, then, we sometimes found that friendship designations were not mutual and that they changed over time.

**Implications for Prevention and Early Intervention in Heroin Spread.**—Our earlier work on the natural course of heroin epidemics<sup>1</sup> and our current work on recent outbreaks of addiction in defined neighborhoods have permitted us to identify some of the natural and programmed events that seem to halt heroin spread. For example, one factor that may limit the size of outbreaks in microepidemic areas is the size of the extant polydrug using population, a hypothesis suggested by our finding that heroin seems to spread among experienced polydrug users.

Furthermore, the individuals involved in a particular microepidemic cannot exist as independent social units; their need for a continuous heroin supply requires that they interact as members of a common social system. Therefore, the removal of one or more key members of the distribution structure in a microepidemic, whether by enforcement or treatment agencies, frequently disrupts the entire social system until members establish new sources of drug supplies. In macroepidemic neighborhoods, on the other hand, the removal of one or more key drug distributors tends to have little disruptive effect on the system as a whole because heroin is available from multiple sources. Macroepidemics produce sizable populations of heroin addicts who tend to remain in their neighborhoods of origin despite extensive enforcement pressure. Usually they establish local street copping areas, and thereafter addiction becomes endemic to the neighborhood.

The intervention model described in this report is an outgrowth of our epidemiologic field studies of addicts in their natural setting. It is based upon the established public health practice of halting the spread of contagious dis-

orders such as venereal disease by using the first case identified to locate and treat others involved. Because of the social nature of the process of heroin spread, the addict or experimenter can identify the individual who introduced him to the disease-producing agent and can lead treatment teams to other new users. By employing these epidemiologic principles in our intervention model, we were able to rapidly involve in treatment the majority of addicts in a microepidemic neighborhood.

We are currently testing a more complex model for responding to macroepidemics. After observing for a period of one year the macroepidemic shown in Fig 4, we opened a multimodality treatment program in the neighborhood and offered immediate admission to all heroin addicts in the community. Following this, an epidemiologic field team made intensive efforts to involve the less motivated addicts in treatment. We are now in the final stage of the project, which includes a series of meetings with community leaders to determine how we might involve the small number of hard core addicts who continue to resist treatment.

At its present stage of development, our intervention model has a number of limitations. First, it is not predictive—we are able to identify heroin outbreaks only after they occur. Second, while we feel that our approach is sound in offering immediate treatment to all addicted persons in a particular community, we are uncertain as to what type of intervention might be directed at those who are only experimenting with heroin and not yet addicted. Third, our use of contagious disease concepts may suggest to some the applicability of quarantine systems for halting heroin spread. However, our ability to enlist the cooperation of addict patients to involve others is based on their desire to help rather than punish their friends. Therefore, we suggest that quarantine procedures be approached with caution and tested only in the context of a comparative evaluation framework.

The effectiveness of this intervention model should improve with advances in treatment technology for addiction. At the present time the rehabilitation process is both long and demanding, so that many new addicts refuse treatment or quickly drop out if facilities are not located in proximity to their residence. The success of our intervention model in the microepidemic and macroepidemic areas described in this report was due to our ability to make treatment easily available in the neighborhoods involved. Despite our efforts to respond as quickly as possible in the macroepidemic area, however, a full six months was required to open a facility in that community. Clearly, we need a more flexible treatment response sys-

tem so that new outbreaks can be contained immediately. There is a need to test various approaches to this problem, including the use of mobile treatment units, and the use of hospitals and retail pharmacies as methadone dispensing units. Similarly, the development of longer lasting pharmacotherapy agents would be of particular importance in reducing the demands upon the addict for daily visits to methadone clinics.

Ideally, a comprehensive model for prevention of addiction would require that we identify and correct the underlying causes of the disorder, thereby eliminating the need for intervention at a later stage. Until this is possible, however, the approach described here may serve as one element in a network of prevention efforts. The schools represent an additional element and must develop effective drug education programs to strengthen the resistance of young people to the disorder. Similarly, enforcement agencies must expand their efforts to reduce the availability of heroin at the community level. Finally, treatment agencies must increase their efforts to reach the large population of heavy polydrug users who are especially vulnerable to heroin spread.

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