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# Continuing Outbreak of Hepatitis A Linked with Intravenous Drug Abuse in Multnomah County

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## Synopsis

*A communitywide outbreak of hepatitis A occurred in Portland, OR, from 1983 through 1986. At the peak of the outbreak, the age- and sex-specific annual incidence rate approached 400 cases per 100,000 population among men ages 25 to 34, the highest risk group. The community incidence rate was nearly 10 times the relevant national incidence rate.*

*A review of the records concerning cases of hepatitis A reported in the last 6 months of 1985 revealed that about half the number of young adults whose cases were investigated during that time reported a history of intravenous (IV) drug use—a proportion about 50 times greater than expected among persons in that age range. A simultaneous epidemic of overdose deaths from heroin and a concomitant increase in hepatitis B incidence rates led to the suspicion that this was a drug-abuse-associated epidemic of hepatitis among new IV drug users.*

*Control of this outbreak was difficult because the population most at risk was distrustful of public health officials. Increased surveillance in food service establishments and schools might have prevented outbreaks from a common source in the general population; however, an increase of sporadic cases in the nondrug-using population clearly occurred.*

THE MULTNOMAH COUNTY HEALTH DEPARTMENT began receiving reports in 1983 of an increase in cases of hepatitis A among young intravenous (IV) drug users in other counties of Oregon (*1*). The first reports came from rural counties in southern Oregon and subsequent ones from counties in the Portland metropolitan area adjacent to Multnomah County. In August 1983, we noted a sudden increase in the numbers of hepatitis A cases being reported to the Multnomah County Health Protection Division (HPD) (*2*). At the same time, HPD nurse epidemiologists who investigated those reports began hearing persons with hepatitis A frequently relate a history of IV drug use.

The epidemic of hepatitis A continued for more than 3 years. We undertook a retrospective study of the descriptive epidemiology of hepatitis A in Multnomah County during 1984 and 1985 to determine whether there was unusual hepatitis A activity among drug users and whether any additional hepatitis A control measures could be brought to bear.

## Materials and Methods

Multnomah County is the most urbanized county in the State and the most populous (562,000); it contains the city of Portland, the largest city in Oregon. State law requires that cases of certain communicable diseases be reported to the local health department. Nearly all reports of hepatitis A are documented by an IgM-specific hepatitis A virus antibody test, and each confirmed report is investigated by a nurse epidemiologist.

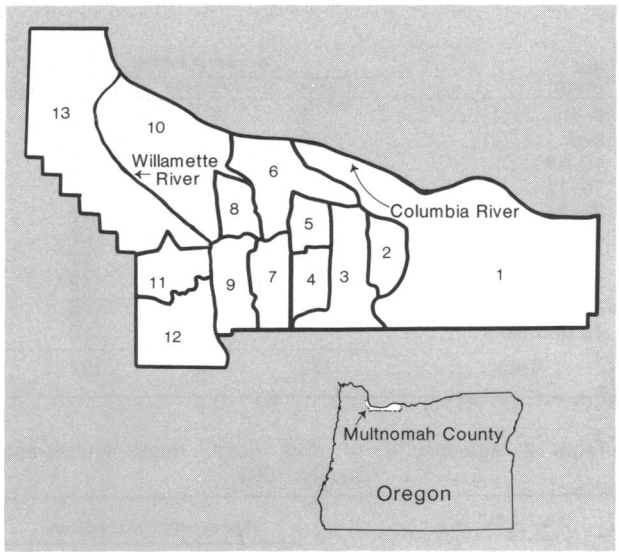
Because of an outbreak of hepatitis A earlier in the year in Douglas County, OR (*3*), that was associated with IV drug abuse and reports of drug-abuse-associated cases in neighboring counties, disease investigators (nurse-epidemiologists) in Multnomah County asked nonstandardized questions about IV drug use among hepatitis A patients until the end of 1983. By January 1984, standard questions on illicit drug use were routinely asked of all persons with hepatitis A who were reported to us. We specifically asked about types of drugs and routes of administration and recorded the information in free form on an addendum to the Centers for Disease Control's Viral Hepatitis Case Record (CDC 53.1). The Multnomah County Health Department's statistician subsequently coded the drug information according to whether the client (*a*) denied using illicit drugs, (*b*) admitted using IV drugs, or (*c*) admitted using other illicit drugs.

We reviewed the records concerning the 464 cases of hepatitis A reported in Multnomah County (83 per 100,000 population) with onset during 1984 and the 585 cases (104 per 100,000) with onset in 1985. The 1985 rate was nearly 10 times the U.S. rate for that period (*4*).

For the years 1984 and 1985, we tabulated age- and sex-specific rates of reported hepatitis A and hepatitis B illnesses. For hepatitis A patients, we tabulated, by month of report, the proportion of self-reported use of IV drugs, use of other illegal drugs, and no use of illegal drugs. From a sample of records (of persons whose last name begin with the letters A through Q and who had onsets of illness between July and December 1985), we calculated age-specific rates of hepatitis A for both males and females. Then, for each age range, we tabulated the proportion of that population with hepatitis A who had reported the use of IV drugs.

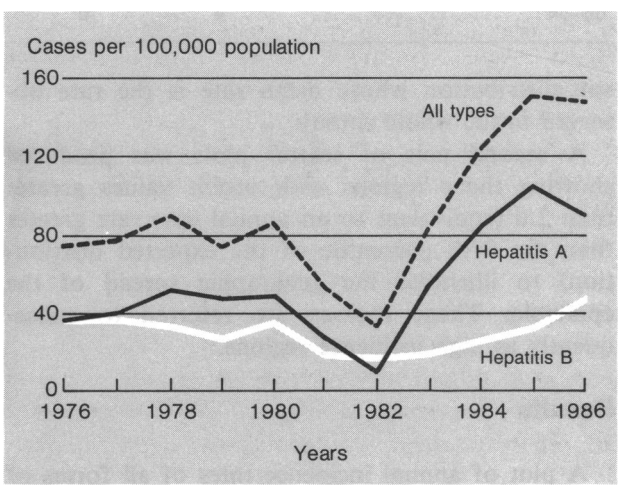
By late 1984, the Multnomah County medical examiner had noted an increase in the number of deaths due to heroin use. From vital statistics data for Multnomah County, we obtained the number of deaths due to drug overdose in 1985 and tabulated these data as age- and sex-specific rates.

Figure 1. Regions of Multnomah County, OR




NOTE: Regions 1-3 are primarily rural; regions 4-10 are mixed residential and commercial. Region 11 contains the central part of Portland and is residence for transients with communicable diseases. Region 12 contains the city's affluent suburbs. Region 13 has dense urban housing and a substantial proportion of Portland's male homosexual population. Historically, the rates of hepatitis A, hepatitis B, giardiasis, shigellosis, amebiasis, and sexually transmitted diseases have been higher in region 13 than in the others.

Figure 2. Annual hepatitis incidence rates (cases per 100,000 population), Multnomah County, OR, 1976–86




From 1982 through 1986, crude rates of reported hepatitis A and hepatitis B were calculated for each of the county's 13 geographic regions (see fig. 1). The results were displayed as three-dimensional scatter plots. In addition, an expected number of cases for each region was calculated, based on regional populations and total county incidence each year. The deviation of each region's cases from the expected number was expressed as a probit value, with the assumption that observed hepatitis incidence in small regions follows a Pois-

Table 1. Self-reported IV drug use among hepatitis A patients in the study sample, Multnomah County, 1985

| Age (years) | Number in sample | | | Self-reported IV drug users | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Male | Female | Total | Number of males | Number of females | Total number | Percent males | Percent females | Total percent |
| 0–4 | 3 | 1 | 4 | ... | ... | ... | ... | ... | 0 |
| 5–9 | 3 | 2 | 5 | ... | ... | ... | ... | ... | 0 |
| 10–14 | 4 | 5 | 9 | ... | 1 | 1 | ... | 20 | 11 |
| 15–19 | 22 | 13 | 35 | 12 | 7 | 19 | 54 | 54 | 54 |
| 20–24 | 50 | 16 | 66 | 24 | 3 | 27 | 48 | 19 | 41 |
| 25–29 | 21 | 6 | 27 | 8 | 3 | 11 | 38 | 50 | 41 |
| 30–34 | 11 | 6 | 17 | 1 | 2 | 3 | 9 | 33 | 18 |
| 35–39 | 8 | 4 | 12 | 2 | 1 | 3 | 25 | 25 | 25 |
| 40–44 | 3 | 3 | 6 | 1 | ... | 1 | 33 | ... | 17 |
| 45 and older | 7 | 9 | 16 | ... | ... | ... | ... | ... | ... |
| Total | 132 | 65 | 197 | 48 | 17 | 65 | 36 | 26 | 33 |

Table 2. Age-specific IV drug death rates, Multnomah County, 1985

| Age (years) | Rate per 100,000 population | |
|---|---|---|
| | Males | Females |
| Total | 12 | 1.4 |
| 20–24 | 7 | 3 |
| 25–29 | 16 | 0 |
| 30–34 | 50 | 4 |
| 35–44 | 30 | 0 |
| 45–54 | 12 | 4 |
| 55–64 | 4 | 0 |

son distribution whose mean rate is the rate observed in the whole county.

A second pair of scatter plots was produced showing those regions with probit values greater than 2.0 (equivalent to an annual case rate greater than the 97th percentile of the expected distribution) to illustrate the geographic spread of the epidemic. Those regions are referred to subsequently as high incidence regions.

## Results

A plot of annual incidence rates of all forms of hepatitis for Multnomah County from 1976 through 1986 is figure 2. The bimodal epidemic curve for this outbreak is figure 3. Age- and sex-specific annual incidence rates of hepatitis A and hepatitis B for 1984 and 1985 are shown as figures 4 and 5, respectively. Among young adults, the incidence rate of hepatitis A for males was up to three times the rate for females. The sex-specific rates are similar in children and older persons. For hepatitis B, an almost twofold sex-specific incidence difference between males and females appears among young adults. The figures illustrate that the incidence of hepatitis A in this epidemic peaked at a younger age than that for hepatitis B occurring at the same time in the community.

The racial distribution of hepatitis A and B cases for 1984 and 1985 was similar to the distribution in the county's population; for example, in 1984, 93 percent of all persons with hepatitis A were white, 4 percent were black, and 3 percent were of other races.

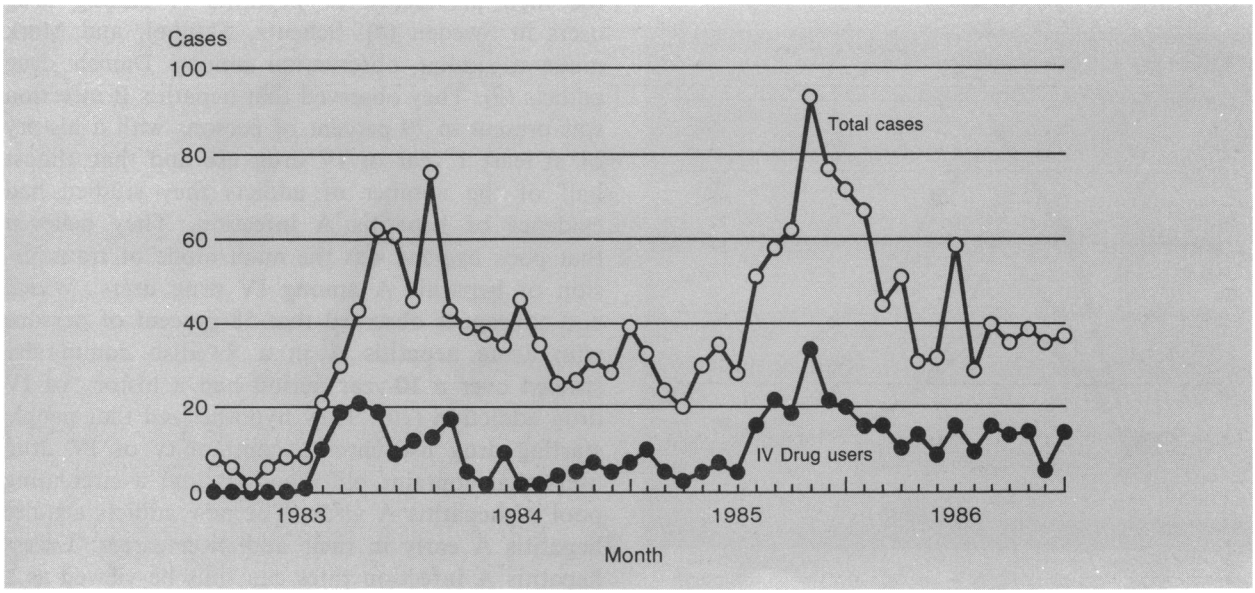
Table 1 shows the results of the review of records for the subsample of cases that were studied to determine age-specific proportions of IV drug use. Among young adults, more than half of the men and women with hepatitis A admitted to IV drug use. Overall, 26 percent of women (95 percent confidence interval 16 to 39) and 36 percent of men (95 percent confidence interval 28 to 45) with hepatitis A admitted using IV drugs. In the sample of persons with hepatitis A, the ratio of men to women was almost exactly 2:1, but the ratio of male to female drug users who had hepatitis A was almost 3:1.

Table 2 shows age- and sex-specific drug overdose death rates for Multnomah County for 1985 (*5*), representing 36 deaths during the year (9 blacks, 25 whites, 2 other races). The modal age for males who died of drug overdoses was 30–34 years.

The overdose death rate for females was a little more than one-tenth the rate for males. Blacks, who represent only about 5 percent of Multnomah County's population, accounted for 25 percent of the drug overdose deaths. They accounted for a little less than 5 percent of reported hepatitis A and B cases in 1984 and 1985. There were 41 drug deaths in 1986 among users of similar age, sex and race.

Figures 6 through 9 show the geographic distribution of cases of hepatitis A and hepatitis B in Multnomah County from 1982 through 1986. Figures 6 and 7 show geographic patterns of hepatitis

Figure 3. Hepatitis A cases, by month of onset, and drug use, Multnomah County, OR, 1983–86



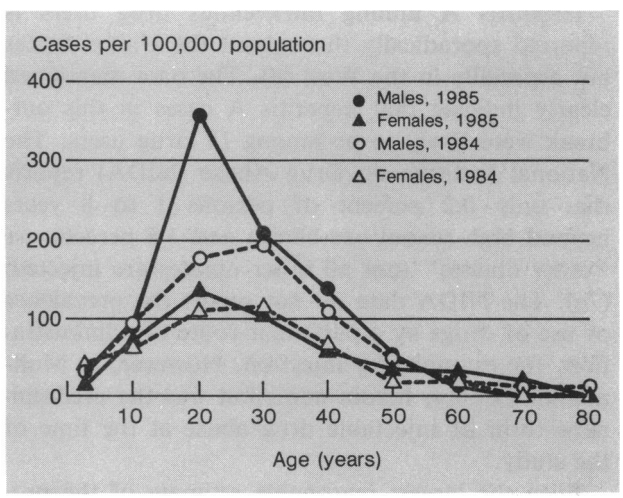

A incidence; figures 8 and 9, of hepatitis B incidence. In figure 6, the shifting pattern of hepatitis A in the county during the epidemic period is illustrated. In 1982, 1984, and 1986, region 13 was a high incidence area; however, in 1983 through 1985, the highest relative incidence was in the southeast part of the county, beginning in regions 7 and 9 in 1983 and spreading to include region 4 by 1984. In 1986, as the overall epidemic was passing its peak, region 10 became a high incidence area.

By 1986, the southern part of the county had the same proportion of cases as would be expected from its population. In the meantime, the proportion of cases from the northwest parts of the county had returned to pre-epidemic levels. Thus, the geographic focus of the epidemic had moved from the southern to the western and northern parts of the county. The second wave of the epidemic was associated with a different geographic cluster of susceptible persons.

Crude hepatitis A rates are shown in figure 7. There is a general increase in the incidence rate from year to year, with an obvious cluster of increased incidence rates in the middle of the graph, corresponding to the southern regions and peak years of the epidemic.

No comparable pattern is seen in the hepatitis B data (figs. 8 and 9). During the period 1982–86, region 13 had the greatest incidence of hepatitis B, with excessive cases also occurring most of that time in region 11. The crude rates show a slow increase in hepatitis B over the interval.

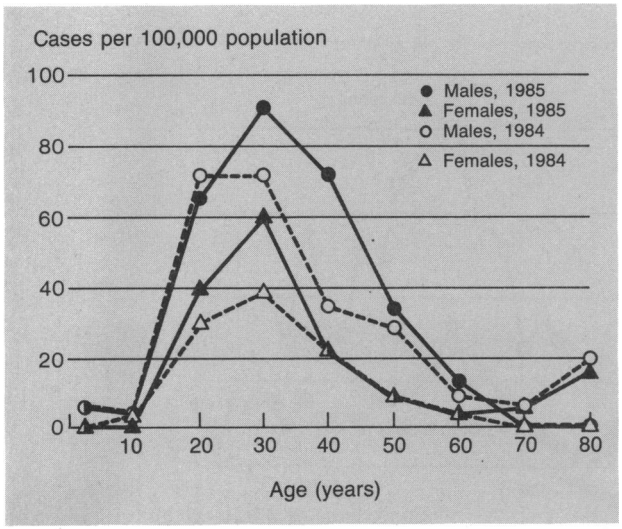
Figure 4. Age-specific hepatitis A incidence rates for Multnomah County, OR, 1984–85




## Discussion

According to the Oregon Health Division, Oregon has a 7- to 9-year cyclic pattern of hepatitis A incidence. Figure 1 documents the low incidence rate immediately preceding this outbreak. The observed rise in the number of cases was partially explained by the background of cases in the State. The relative dearth of the disease immediately before the outbreak must have created a large pool of susceptible people. At no time previously had annual incidence rates of hepatitis exceeded 100 per 100,000 population in Multnomah County. Nor do

Figure 5. Age-specific hepatitis B incidence rates for Multnomah County, OR, 1984–85




secular trends explain the apparent concentration of cases among drug users or rapidly shifting geographic patterns of incidence.

Hepatitis A among intravenous drug users is reported sporadically throughout the United States but especially in the West (*6*). The data mentioned clearly indicate that hepatitis A cases in this outbreak were likely to be among IV drug users. The National Institute on Drug Abuse (NIDA) reports that only 0.2 percent of persons 1 to 8 years beyond high school use heroin and 3.6 percent use "other opiates" (not all other opiates are injected) (*7a*). The NIDA data do not report the prevalence of use of drugs by a particular route of administration, for example, by injection. However, in Multnomah County, heroin addiction was the predominant form of injectable drug abuse at the time of the study.

Even the largest reasonable estimate of the proportion of IV drug users in the adult population—a 5 percent upper limit given for New York in an unpublished estimate from the Addiction Research Center (Source: W. R. Lange: Estimate of the national seroprevalence rate of HIV antibodies in intravenous drug users. Personal communication, November 20, 1987)—is well below the rate seen among these hepatitis patients. Furthermore, the estimated proportion of IV drug use among persons with reported hepatitis A cases must be considered a minimum; actual IV drug users had every reason to conceal their habits from disease investigators, and investigators had no independent means of verifying drug-use histories unless they observed needle tracks at the time of the interview.

Norkrans and his coworkers have documented the high prevalence of hepatitis A among drug users in Sweden (*8*). Scheutz, Skinhøj, and Mark made a similar observation among Danish drug addicts (*9*). They observed that hepatitis B infection was present in 79 percent of persons with a history of at least 1 year of IV drug use and that almost half of the number of addicts they studied had evidence of hepatitis A infection. They believed that poor hygiene was the main mode of transmission of hepatitis A among IV drug users. Widell and colleagues observed that 58 percent of persons with acute hepatitis A in a Swedish community studied over a 10-year period had a history of IV drug addiction (*10*). They hypothesized that people starting drug use enter a community of IV drug users that contains older addicts and a circulating pool of hepatitis A virus. The new addicts acquire hepatitis A early in their addiction career. Excess hepatitis A infection rates can thus be viewed as a marker for initiation of IV drug use among young adults.

Finally, Minichiello and Retka observed a modal age incidence of hepatitis A among persons in the 20- to 24-year age range and speculated that the sharp peak of hepatitis A onset among young adults was due entirely to drug use (*11*). They believe that hepatitis incidence is a good indicator of a community's level of IV drug use.

Our study appears to support Minichiello's observation. We have observed a substantial excess of cases and an increased rate of IV drug use among young adults, compared with children and older adults. The male to female ratio among persons with hepatitis between the ages of 15 and 44 was 3:1 in our study sample. This ratio is consistent with sex-specific prevalence rates in NIDA surveys that show a 4:1 excess of males over females using heroin post-high school (*7b*).

We have other independent sources of information that lead us to conclude that an associated epidemic of IV drug abuse was occurring in Portland, namely, reports from drug treatment facilities and police and reports of increases in drug overdose deaths. The Multnomah County medical examiner's office reported an almost tenfold rise in the number of drug overdose deaths annually from before 1983 to 1985. The observed death rate among 30- to 34-year-old males in 1985 would make drug overdose the leading single cause of death among persons in that age range if all deaths were combined instead of being separated by intent (accident, suicide, homicide, and undetermined). At the same time, Portland Police Bureau authorities

Figure 6. Hepatitis A cases in Multnomah County, OR, 1982–86, by region

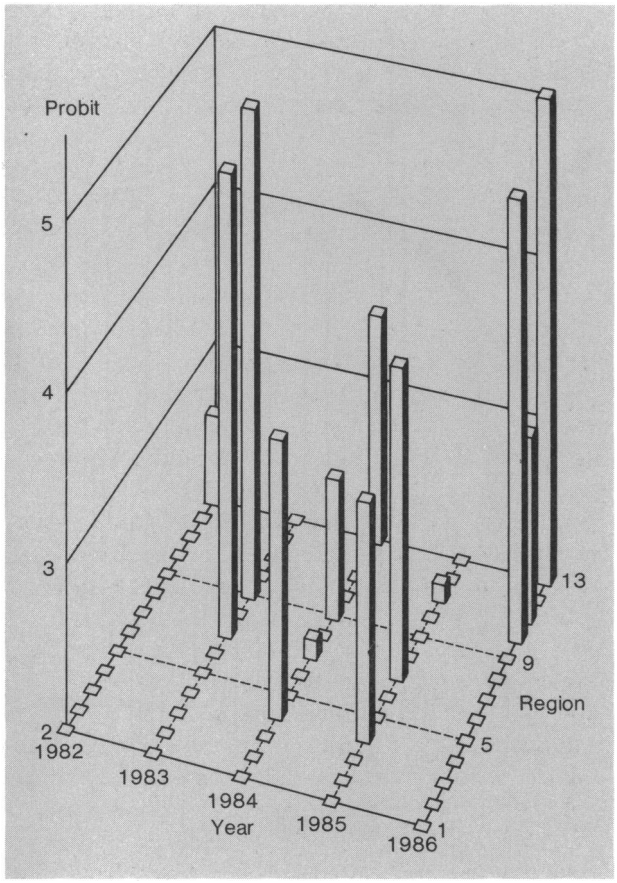
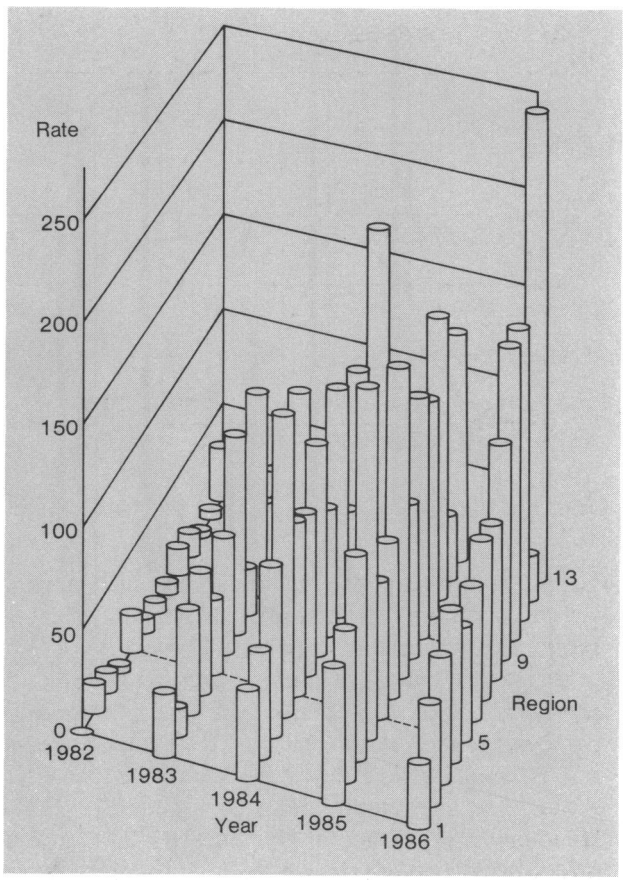



Figure 7. Hepatitis A rates per 100,000 population for Multnomah County, OR, 1982–86, by region




noted an increase in heroin trafficking in Portland and a sharp decrease in its price in 1985–86.

The difference in ages between the group with hepatitis A and the group dying of drug overdose is striking. It suggests that persons who are getting overdoses have been using IV drugs longer than persons who have clinical hepatitis. The discrepancy in race-specific events, with hepatitis reflecting the community's racial characteristics and overdose deaths occurring disproportionately among blacks, also suggests that the drug users who were hepatitis-infected and the drug users who died from overdoses were from samples of different populations. This thought is further supported by anecdotal reports from the Multnomah County medical examiner, who notes that many of his cases were of persons who had long criminal records and histories of long-term IV drug use, and is consistent with the observation of Kozel and Adams of an aging population of drug users making emergency room visits (*12*).

We have not determined the mechanism of transmission of hepatitis A among addicts. The person-to-person route via fecal-oral contamination through casual, crowded living arrangements is a reasonable hypothesis of exclusion. The epidemic curve with its two peaks is not suggestive of a common source (for example, contaminated heroin lot), and the peripatetic geographic spread in the State and county also does not support such a mechanism. We would have expected a simultaneous outbreak with a large, single peak of increase. We have not done viral studies on drugs or paraphernalia to rule out either contaminated heroin or blood-to-blood transmission. Needle transmission of hepatitis A is believed to be rare because of the short viremia of hepatitis A compared with hepatitis B (*13*). Occasional IV transmission has been documented (*14*). Parenteral transmission would not explain cases among nonusers.

At the time of the outbreak, we were completely unaware of the reported association between hepatitis A and intravenous drug use. So, for that matter, was CDC, whose data collection form instructed interviewers to skip the IV drug question when hepatitis A is reported. As noted in the introduction, we collected only a minimal drug-use history. No record was made of the type of drug

Figure 8. Hepatitis B cases in Multnomah County, OR, 1982–86, by region

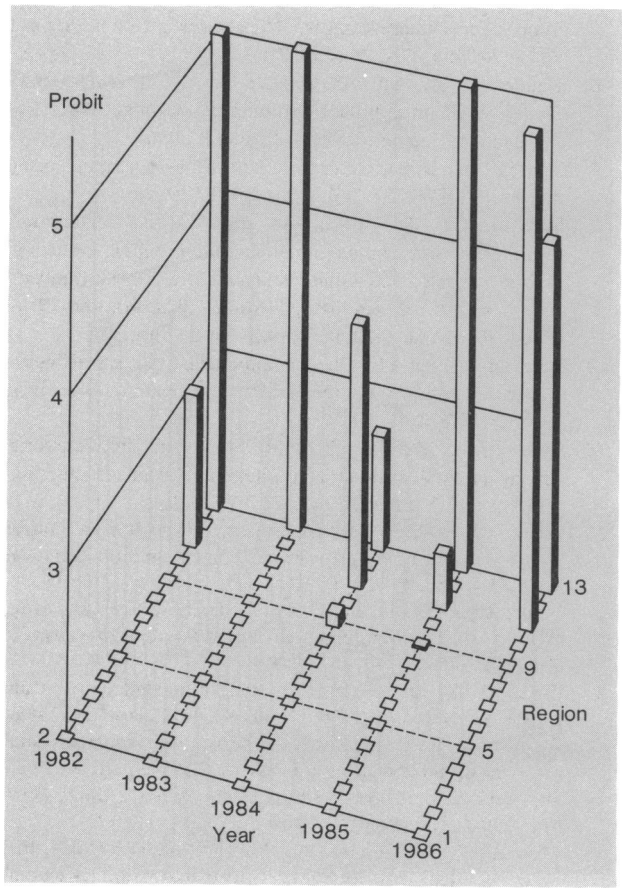
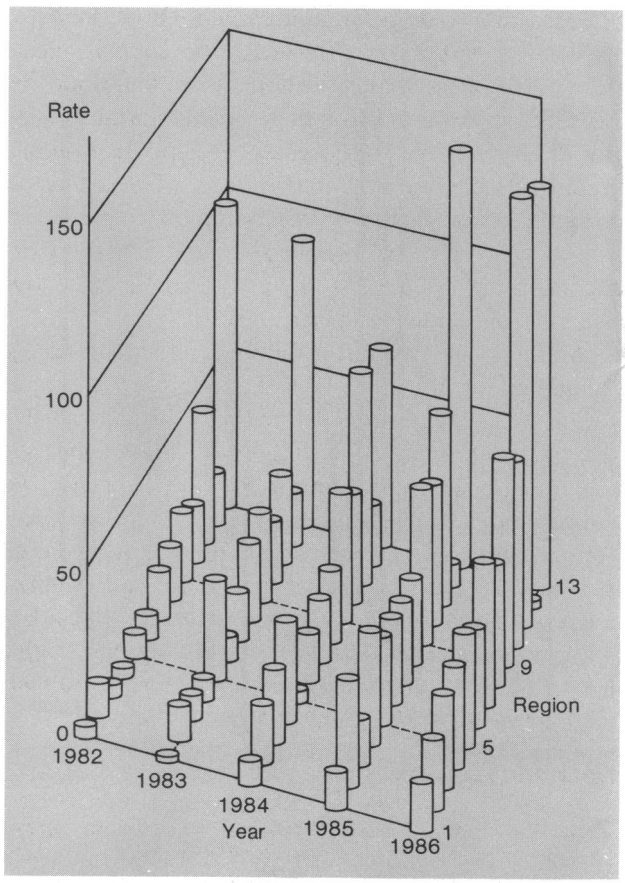



Figure 9. Hepatitis B rates per 100,000 population for Multnomah County, OR, 1982–86, by region




that was injected, nor was a detailed drug-use history obtained. In each case, we asked specifically about marijuana use; those data are not presented here because almost all the patients had had experience with marijuana, and we had not asked about frequency and intensity of use. The questions about illicit drug use were asked of all patients. Young children, of course, had their own disincentives for being truthful about drug use. We cannot exclude the possibility of missed cases of drug use among young teens and pre-teens.

None of the cases in this outbreak were known to be associated with any common source of exposure to hepatitis A. Too few of the patients admitted having been exposed to persons who had hepatitis or high-risk occupations, or having had an association with day care attendees, to make detailed analyses on these known risk factors worthwhile.

Further investigation would help clarify several issues:

- How great is the excess of hepatitis A cases among needle users? It would be helpful if questionnaires for national surveys of drug use asked specifically about *needle use*, rather than needle use associated with specific drugs.
- What is the *means of transmission* of hepatitis A in epidemics among drug users?
- Are there *specific drugs* (for example, heroin, methamphetamine) linked to increased hepatitis A incidence rates, or is this a phenomenon associated with the use of all drugs by persons susceptible to hepatitis?

Two new studies may shed some light on these points. NIDA is collecting sera from intravenous drug users around the country to monitor seroprevalence of the human immunodeficiency virus. Detailed drug-use histories are obtained at the same time. If a substudy of hepatitis A antibody prevalence were done of that population, the association of hepatitis A infection with specific drugs of abuse could be documented, if it is present. Another project that has begun is surveillance of the needle-sharing habits of intravenous drug users. Once reliable measures of the frequency and extent of this behavior are adopted, surveillance of viral

hepatitis as well as etiologic studies could include questions on needle sharing.

This study did not provide clues about how to implement more effective hepatitis control measures in a disaffiliated drug-using population. In spite of our awareness of the epidemic in late 1983, the disease spread in subsequent years. In general, traditional methods of containment of hepatitis A through immunoprophylaxis were not successful among IV drug users because of late reporting of diagnosis and inability or unwillingness of drug users to name their contacts.

Although we instituted outreach efforts in drug treatment facilities and to the community at large, we did not receive substantial cooperation from IV drug abusers in investigating cases. Without effective disease control in the highest risk group, we concentrated our efforts in places where a widespread outbreak of hepatitis could have occurred if a case had been introduced: food service establishments, schools, and day care facilities. Education and surveillance of illness in those settings might have prevented or reduced the likelihood of spread through food services and infected children.

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# Malpractice Premiums and Primary Cesarean Section Rates in New York and Illinois


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## Synopsis


*The fear of malpractice liability is mentioned frequently as a cause of increased cesarean section rates, but without quantitative investigations. This perception may be studied at an aggregate level by comparing malpractice insurance premiums, a proxy for liability risk, with primary cesarean section rates.*

*Both New York and Illinois are divided into territories for insurance rates; the premium was uniform within each territory over the period studied for each specialty. Premiums for obstetricians were linked to birth and procedure data from New York and Illinois hospitals for 1981 and 1983, respectively, to determine whether there was a correlation between premium levels and the primary cesarean section rate.*

*A statistically significant difference was found between mean cesarean rates by insurance premium*