NATIONAL ESTIMATES OF THE PREVALENCE OF NARCOTIC ADDICTION

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INTRODUCTION

Knowledge of trends in the extent of narcotic addiction is essential for the evaluation and planning of treatment and prevention programs. Various attempts to estimate prevalence and incidence have been characterized by differences in definition, nomenclature, assumptions and methodology. (Richman, 1974).

This paper describes some of the statistical fallacies associated with recent national estimates of the prevalence of narcotic addiction. The log normal nature of the spatial distribution of narcotic addiction is identified and a new biometric approach for estimating prevalence is illustrated by recent data for New York City.

BACKGROUND

Population surveys of the extent of narcotic addiction have been unsatisfactory because of difficulties in surveying those at highest risk of narcotic use. Chambers concluded that his 1971 interview survey of New York City residents was successful in identifying only "one-third" of the actual population of regular heroin users.

The National Commission on Marijuana and Drug Abuse found 0.2% of youths and 0.1% of adults had used heroin within six months of interview but emphasized the limitations of such data in providing no indication of the extent or characteristics of users who go beyond the initial experience to adopt patterns of more prolonged, frequent or intensive drug use, for which data on duration, frequency, and intensity are essential.

SOURCES OF DATA

Information about "known" users has been derived from law enforcement agencies, clinical treatment facilities, and cumulated from various sources by case registers.

Blumstein et al emphasized that these data sources are generally viewed as incomplete in coverage, as unpurged of the dead, the cured, and the emigrant, and as the products of recording processes listing individuals, at times, without due regard for evidence of drug use or addiction; they concluded that attempts to estimate the national extent of heroin addiction were "...relying on questionable extrapolation, based on tenuous hypotheses, from elusive data..."

Law Enforcement Agencies

Since 1954 the Bureau of Narcotics and Dangerous Drugs has published annual reports of the number of "active" narcotic users in the United States. The report for 1969 acknowledged that BNDD was unable to assess the degree of validity of their statistics for determining prevalence of narcotic use.

Clinical Treatment

A second source of data on heroin users is derived from the experience of specific clinical treatment facilities. These clinical data are usually affected by the treatment modalities and admission policies of the specific agencies and do not represent the incidence or prevalence of heroin dependency in the community.

Case Registers

The New York City Narcotics Register collates reports required by law from health agencies, law enforcement groups, private physicians, and other persons, institutions and agencies, having contact with drug abusers. No standard definition of narcotic dependency is used. All reports are accepted without confirmation.

Narcotic Register tabulations of the cumulated number reported over a period of time are often misinterpreted as showing the characteristics of persons alive, residing in the community and addicted at the end of that time period. The Narcotics Register (1973) now recommends that at least 25% of all first reports should not be considered in estimating prevalence and in addition currently assumes an annual inactivation rate of somewhere between 10% and 17%.

Error is further compounded when Narcotics Register data are used without correction for the effect of aging. Eighty-eight thousand drug abusers were reported under the age of 25 to the Narcotics Register by the end of 1970; if all of these were still addicted in New York City at the end of 1970, it is estimated that thirty per cent would be over 25 at the end of 1970. This lack of aging (the Peter Pan Principle) frequently results in comparison groups being erroneously considered to be older than those reported to the Narcotics Register.

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NATIONAL ESTIMATES OF PREVALENCE AND INCIDENCE

The extent of narcotic addiction has been estimated in many ways. This diversity of methods results from the lack of any single, satisfactory approach. In addition to inconsistent definitions of prevalence, a wide variety of ratios are used, without justification to "correct" for undercounting. (U.S. Senate Committee), (Richman, 1974)

Combinations of Data from BNDD and New York City Narcotics Register

McGlothlin et al estimated there were 375,000 narcotic addicts in the United States at the end of 1971. They assumed that 125,000 of the 175,000 names of the New York City Narcotics Register were active narcotic addicts, and that the Register was 60-80% complete--resulting in a prevalence of 150-200 thousand. Since 40% of the 82,000 persons listed on the 1971 BNDD file were from New York City, the estimate for New York City was inflated to a national estimate of 375,000.

Drug Related Deaths

The number of "heroin overdose" deaths has been used as a multiplier to estimate prevalence. Dupont estimated that 42 deaths from opioid overdosage in Washington, D.C. represented 16,800 heroin users. Such extrapolations are unjustified not only because of the problem in selecting an appropriate multiplier and the difficulty in defining drug related deaths (Brecher), but because there are major changes in mortality among drug users followed over a number of years. (Jackson and Richman)

Andima et al determined that 61% of the 114 deaths aged 15-19 in 1970 were previously unknown to the Narcotics Register and a multiplier of 61/39 was applied to the 36,019 Narcotics Register cases first reported before the age of 20 up to the end of 1970.

This method assumes that all persons reported under the age of 20 to the Narcotics Register before 1971 were still alive and addicted in New York City and under 20 years of age at the end of 1970. Applied to all age groups, this approach produced an estimate of 316,918 New York City narcotic addicts at the end of 1970.

Crime Statistics

Newmeyer has estimated prevalence by making multiple assumptions of the number of unreported burglaries, the proportion of burglaries committed by opiate addicts the cost of the average addict burglar's habit while using opiates, and the proportion of addicts whose habits are entirely supported by burglary,etc.

Capture-Recapture Techniques

Greenwood used capture-recapture methods for estimating the prevalence of heroin addiction. BNDD data were used to derive 1969 estimates of 150,000 heroin addicts for New York City, and a national total of 315,000. Later calculations provided national estimates of 524,000 for 1970 and 559,000 for 1971.

REQUIREMENTS FOR PREVALENCE ESTIMATES

All of the above methods involve assumptions which are not supportable. Sources are used which do not reflect current clinical activity - Narcotics Register counts include persons first reported before 1964 and BNDD lists include persons reported up to five years earlier. Addiction is assumed by some methods to be uniformly permanent, without remission, to be associated with permanent residence in New York City, and to involve a suspension of aging.

The natural history of narcotic addiction is not uniform. At the end of 1967 there were more active addicts (22,535 addicts) known to BNDD for over five years than there were three years later at the end of 1970 (20,596). (Statistical Abstract of the United States) Robins has demonstrated the low degree to which narcotic addiction persisted among veterans found to be using narcotics in Vietnam. The clinical characteristics and treatment needs of addicts from different report sources are erroneously assumed to be similar.

Finally, demographic concentrations are not recognized in that national extrapolations are often made from New York City data without consideration of the marked demographic differentials.

The rest of this paper describes an approach which meets the above requirements. This approach includes:

1) identification of the log-normal nature of the spatial distribution of narcotic addiction in New York City.
2) estimation of geometric dispersion of the prevalence of narcotic addiction derived from Narcotics Register data.
3) use of data from a clinical facility with enhanced opportunity for contact with actively addicted persons in a defined geographic area and calculation of age-sex-color specific population-based ratios.

4) application of order statistics for estimating the city-wide prevalence of addicts.

SPATIAL DISTRIBUTION OF NARCOTIC ADDICTION

Narcotic addiction is highly concentrated within certain geographic areas. Spatial concentrations of drug addiction were shown in Chicago by Faris and Dunham, and Dai.

Chein et al studied the distribution of 3,457 boys aged 16-20 reported from New York City law enforcement agencies and hospitals as involved with narcotics, between 1949 and 1955. Over three-fourths of the census tracts had no cases reported. Census tracts with 29% of the boys contributed 83% of the cases. Koval's analysis of New York City Narcotics Register data found similar spatial concentrations for 1964-1967.

STATISTICAL DISTRIBUTION OF PREVALENCE RATIOS

This section demonstrates the log normal distribution of the prevalence of narcotic addiction within the 30 Health Districts of New York City. Koval derived the age-specific ratios of narcotic addicts within the 30 New York City Health Districts from reports made to the Narcotics Register 1964-1967. Koval's data were plotted on log normal probability paper for the group aged 25-29 and a straight line fitted by inspection by procedures described by King and Ferrell. See Figure .

The intersection of the fitted straight line with the 50% probability line is a good estimate of the mean of the logarithms or the geometric mean- in this case 2.1% for the population aged 25-29. The standard deviation of the logarithms or geometric dispersion was estimated by dividing the value at the 93.3% point (100) by the value at the 6.7% point (4) and taking the cube root of the result. The estimated geometric dispersion or g is 2.9. Now g is used similarly to σ for the normal distribution with the substitution of multiplication and division for addition and subtraction. The geometric mean multiplied by $g \pm 2$ includes about 95% of the values. From Koval's Narcotics Register data, 95% of the values are included within the range 0.2%-17.7%, that is the 95% confidence limits for the prevalence of narcotic addiction are estimated to be between 0.2% and 17.7% for the group aged 25-29 years.

Confidence intervals for this distribution were determined, the geometric dispersion being raised to a power appropriate for both percentile and sample size of 30 (King). All of the plotted points fell within the confidence intervals. The 95% confidence limits of the estimated geometric mean of this distribution are 1.4% to 3.1%.

The 1970 Census enumerated 596,566 persons in the 25-29 age group. Applying the estimated geometric mean of 1.4% - 3.1% to this population gives a 95% confidence interval of 8,400-18,600 addicts aged 25-29.

A second source of data on the recent spatial distribution of narcotic addiction was found in the census tract distribution of 833 persons classified as narcotic addicts by the Baltimore City Police Narcotic Unit from December 1, 1966 to November 30, 1968. (Nurco) The median rate was 77 per 100,000 and ranged from one per cent to zero. The transformation of log (x + 20) was plotted, a straight line fitted, and estimates made for the geometric mean of 90 per 100,000 and a geometric dispersion of 2.2.

PROBLEMS IN USE OF NARCOTICS REGISTER DATA

We have referred earlier to problems in defining current clinical characteristics and needs of persons reported to the Narcotics Register from various sources over a period of time.

There is an additional problem in selecting denominators appropriate for calculating geographic distribution of heroin dependency. With longer time intervals, there is a progressively increasing discrepancy between the number of persons who have lived in the area at any time during that interval and the number at the midpoint of that interval (persons and person-years).

In areas with many addicts, the cumulated number reported over many years can be a relatively high proportion of the census population. Nearly "15%" of Cental Harlem's population aged 15-44 were reported to the Narcotics Register between 1964-1967 (Koval).

The Narcotics Register data do not adequately describe the geographic distribution of persons currently defined as actively addicted. It is necessary to have data on the characteristics and geographic distribution of persons known to be dependent on narcotics, which give a more current picture of actively addicted persons during a relatively short time period. Such data are described in the next section.

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These data are from narcotic addicts seen at M.J. Bernstein Institute, MJBI (formerly the Manhattan General Hospital) of the Beth Israel Medical Center, whose need for care has been medically substantiated. (Richman, Feinstein and Trigg)

Although MJBI is located in Lower Manhattan, patients come from all Boroughs of New York City. The relation of MJBI patients to addicts seen elsewhere has been assessed for a sample of 155 persons first reported to the Narcotics Register in 1967. By the end of 1968, 25% of the Narcotics Register sample had been admitted to MJBI. (Richman et al, 1971)

Andima reports that one-half of all addicts who died in New York City in 1970 had been known to the Narcotics Register before death. One-half of those reported to the Narcotics Register before death, had been previously hospitalized at MJBI. (Jackson and Richman). Thus, MJBI had previous contact with 25% of narcotic-related deaths during 1970.

POPULATION BASED PREVALENCE RATIOS, LOWER EAST SIDE HEALTH DISTRICT, MANHATTAN

Narcotic addicts who applied to MJBI for care or were in treatment during June 1, 1970 - June 30, 1972 completed a questionnaire equivalent to that used in the 1970 Census. (Richman, 1973) About three thousand individual residents of the Lower East Side Health District were considered to be dependent on narcotics during a 25 month period. The age-sex-color characteristics of these individuals were used to derive population based ratios from the 1970 Census reports for the Lower East Side. See Table

ESTIMATION OF PREVALENCE OF ADDICTION NEW YORK CITY - 1971

These age-sex-color specific prevalence rates were applied to the New York City population. If New York City had the prevalence represented by MJBI's experience with Lower East Side Health District residents, there would have been a city-wide total of 104 thousand addicts.

But the prevalence of narcotic addiction in the Lower East Side is above the City-wide average and, on the other hand, MJBI was not in contact with all narcotic addicts in the Lower East Side Health District. It is possible to estimate the contrasting effects of these two factors.

Firstly, recognizing that the Lower East Side rates are higher than those of New York City, what is the estimated number of New York City addicts? The Lower East Side had the sixth highest rate of the 30 Health Districts in Koval's study. The sixth order statistic in a sample of thirty is 0.89 standard deviations from the mean (Mosteller and Rourke). Using this value of 0.89 and the geometric dispersion of 2.9 estimated earlier, we get

$$\frac{104{,}000}{(2.9)^{0.89}} = 40{,}000$$

That is, by considering the MJBI experience with the Lower East Side in terms of the ranking of the Lower East Side relative to New York City, we can estimate by order statistics that New York City would have 40,000 addicts.

However, MJBI did not see all New York City addicts during those two years. We know that MJBI was in contact with at least 25% of those first reported to the Narcotics Register in 1967; and 25% of the narcotic-related deaths in 1970. These ratios can be used to estimate the number of addicts in New York City at that time as:

$$\frac{40{,}000}{.25} = 160{,}000$$

CONCLUSIONS AND SUMMARY

There is no substitute for valid data or reliable methods in epidemiologic research. Estimates of the prevalence of narcotic addiction which are based on faulty assumptions, unstated premises, or unsubstantiated multipliers are useless. The natural history of narcotic addiction, the validity of source data, and the highly specific demographic and spatial distributions of narcotic addiction must be considered in assessing prevalence.

A log normal distribution has been identified for the prevalence of narcotic addiction in New York City and Baltimore. This log normal distribution is of major importance for analyzing the dynamics of spatial spread or diffusion.

In addition to considering trends in incidence, changes in the geometric dispersion of the distribution of prevalence by place would reflect the stage of growth or spread of epidemic disorders.

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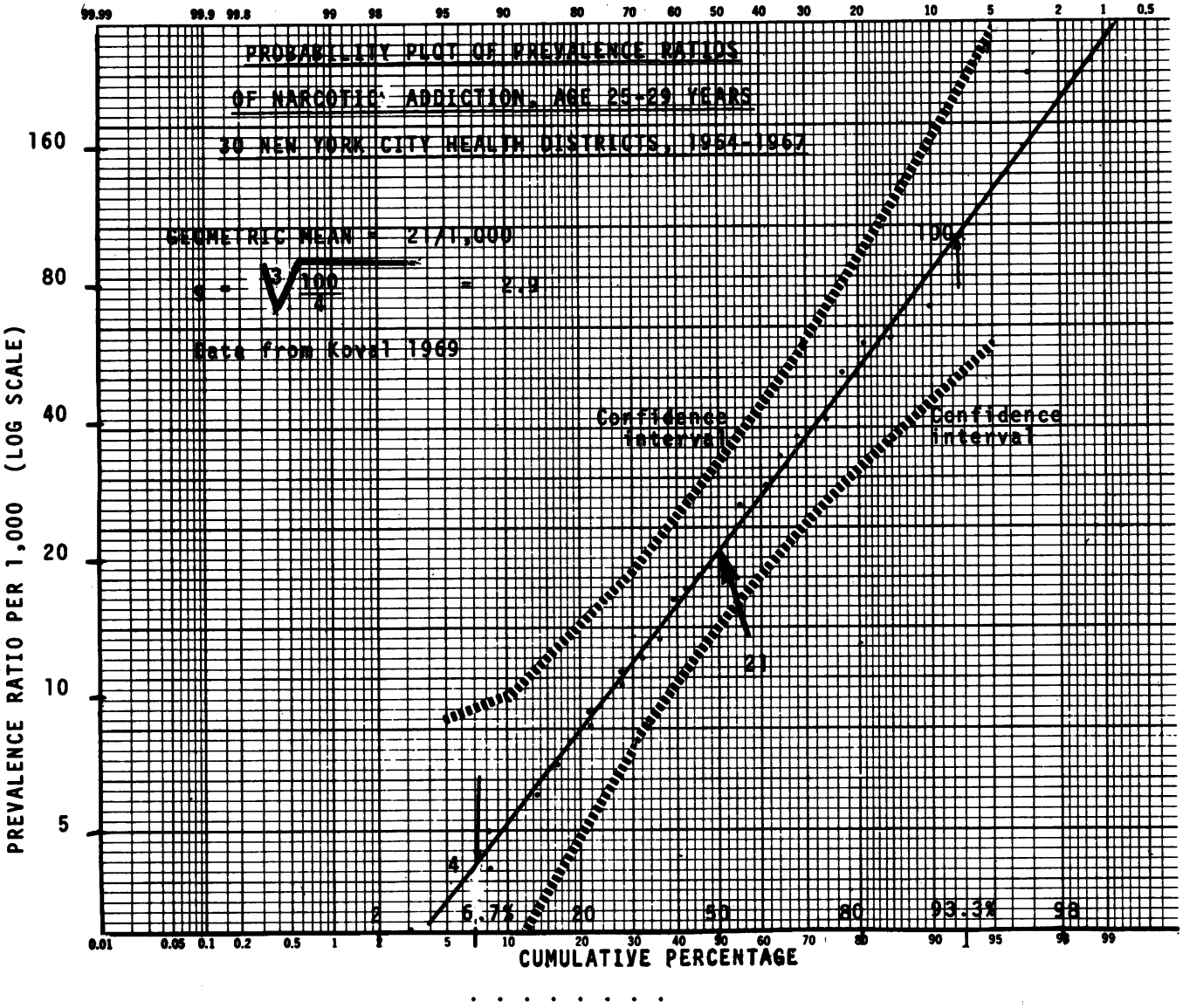

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CONTACT WITH INDIVIDUAL NARCOTIC ADDICTS
FROM LOWER EAST SIDE HEALTH DISTRICT, MANHATTAN
TOTAL TREATED PREVALENCE, JUNE 1, 1970 - JUNE 30, 1972

RATE PER 100 POPULATION (1970 CENSUS) BY SEX, AGE GROUP AND COLOR

	MALE			FEMALE		
WHITE	15-24	25-34	35-44	15-24	25-34	35-44
Patients	860	572	134	323	132	26
Census Population	15,212	16,165	11,891	17,619	16,311	11,185
Ratio	5.7%	3.5%	1.1%	1.8%	0.8%	0.2%
BLACK						
Patients	283	295	95	102	60	23
Census Population	2,378	2,270	1,482	2,541	1,921	1,520
Ratio	11.9%	13.2%	6.4%	4.0%	3.1%	1.5%