possibility that one mechanism of drug resistance in *P. falciparum* is similar to that of multidrug resistance in mammalian cells. Other mechanisms of drug resistance may also exist (*2*) and analyses of field isolates will be necessary to determine the importance of these observations to natural drug resistance in *P. falciparum*.

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20. We thank the members of the Chemotherapy of Malaria (TDR) steering committee for their early support and encouragement of this work and S. Aldritt and J. David for their careful criticism of the manuscript. Supported by a grant from the WHO/UNDP/World Bank Tropical Disease research program (to D.F.W.), a grant from John D. and Catherine T. MacArthur Foundation (to D.F.W.), and NIH training grants 1F23 AI07801-01 and 1K11 AI00892-01 (to C.M.W.). D.F.W. is a Burroughs-Wellcome scholar in molecular parasitology. A.W. and A.H.S. are students in the division of biological science at the Harvard School of Public Health. M.P.B. is a student at the Harvard Medical School.

7 November 1988; accepted 24 April 1989

Monitoring the AIDS Epidemic in the United States: A Network Approach

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Respondents in the 1988 General Social Survey (GSS) were asked to scan their acquaintance networks to identify all those who had been a victim of a homicide or had acquired immunodeficiency syndrome (AIDS). Estimates of the sex, race, age, and regional breakdowns for homicides in the last year and for people with AIDS were compared with official statistics. The GSS estimates for the distribution of homicide victims replicate the official statistics quite well. The GSS estimates for AIDS cases suggest that the data provided to the Centers for Disease Control may underestimate by a substantial margin the prevalence of AIDS in the white population of higher socioeconomic status, overstate the relative prevalence of the disease in the minority populations, underestimate the prevalence of the disease in the Midwest, and overstate it for the East.

MONITORING THE SPREAD OF AIDS throughout the population of the United States has posed a special challenge to public health officials interested in bringing AIDS under control. Almost from the onset of the epidemic in the early 1980s, it has been recognized that the incidence of AIDS was highly selective in its geographic and social distribution, both in this country and abroad. The central mechanisms that transmit the disease—certain sexual practices, sharing of needles among drug users, and contaminated blood products—have focused attention on social processes such as mate selection and social intimacy in which these mechanisms are embedded.

In the United States, a key method for monitoring the spread of the disease has been the collation of reports of AIDS cases from local and state departments of public health by the Centers for Disease Control (CDC) in Atlanta (*1*). This data-gathering method has itself been subject to socially based distortions arising out of the controversial nature of the disease with respect both to its biological nature and to its socially stigmatizing implications (*2*). The highly decentralized nature of the CDC reporting system makes it vulnerable to systematic distortions and overt manipulations by interested parties at various levels of the loosely constructed reporting hierarchy (*3*). To deal with these issues, the CDC has now developed a "family of surveys" in an attempt to monitor the levels and trends of human immunodeficiency virus (HIV) infection (*4*). Such surveillance of HIV infection will not replace the need to devise independent methods for monitoring the social epidemiology of AIDS cases in order to assess the strengths and weaknesses of particular estimates and projections.

We report on an effort to devise an independent estimate of the relative prevalence of AIDS across various population subgroups and geographic locations. Its rationale rests on the social network perspective as it is applied to randomly sampled population surveys (*5*). The strategy is to ask an individual with a known probability of selection from a well-defined population to scan his or her primary acquaintance network, defined to include all the persons he or she knows personally as kin, friends, neighbors, co-workers, and more casual and incidental acquaintances, in order to identify all those who possess a particular characteristic, such as a health condition like AIDS or being a victim of a homicide. For most people the size of such a network is fairly large (on the order of 2000 to 6000 persons) (*6*, *7*). However, it also is bounded imprecisely at the margins because of variations in social and personal definitions of who is included in various social relationships. Fully recognizing that different population subgroups may differ in the average sizes of their personal acquaintance networks, Bernard *et al.* (*7*) proposed measurement efforts to determine the size of such networks for the purposes of estimating hard to count populations (*8*).

Personal networks are known to vary greatly in size, social composition, levels of intimacy of mutual access, and density (*5*). All these network features are likely to affect the flow and extent of information about network members in a systematic fashion. However, we shall make the assumption that, on the average, these differences in network structure across individuals are not systematically organized by the social characteristics that are of special interest to us.

In the *1988 General Social Survey* (GSS) (*9*), conducted by the National Opinion Research Center, respondents were asked questions about their acquaintance with

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someone, living or dead, who had contracted the disease called AIDS. Inquiries were made about how many such persons the respondent knew. For the person he or she knew best, the respondent was asked about the nature of the personal tie (lover, kin, coworker, or other relationship), and the age, sex, and race or Hispanic origin of the person with the disease. An identical set of questions concerning the respondent's acquaintance with the victim or victims of a (willful) homicide within the last 12 months were also asked. The intention here was to examine the accuracy of estimates of rare population events that have been carefully enumerated and that are presumably subject to less systematic distortion in official reporting than is likely to be the case for AIDS. The incidence of willful homicides per year is comparable to the prevalence of AIDS in terms of its relative rarity and its demographic incidence (for example, overrepresentation among young minority males). If the essential features of the annual homicide incidence can be reproduced from the GSS sample reports, subject to variability in estimates because of the relatively small sample size, the estimates made with respect to the prevalence of AIDS can be taken more seriously.

The GSS is a national area probability sample of about 1500 households; the face-to-face survey has been conducted annually nearly every year since 1972 and is widely used in research in the social sciences. Respondents are randomly selected adults age 18 and over, one from each household. The 1988 survey was conducted between 14 February and 28 April 1988. For a total of 1481 completed cases, the household response rate was 77.3%, well within the usual range of response rates obtained for the 15 annual surveys to date. The GSS data compare quite closely with decennial census data and Current Population Survey (*10*) data on the demographic and economic characteristics of the U.S. population (*11*).

Table 1 presents homicide data from official statistical sources and GSS 1988. The most recent publication of homicide data in the *Uniform Crime Report* (UCR) (*12*) and the *Vital Statistics of the United States* (*13*) is for 1986 and 1985, respectively; this means there is a 2- to 3-year discrepancy between the reference year and the GSS 1988 report. However, the percentages we are interested in comparing are remarkably stable over time. Despite small differences in definitions of homicide and substantial differences in the constituent organizations doing the reporting (police departments versus coroner offices), the two sets of official data are quite consistent (*14*).

Slightly more than 10% of the GSS sample claimed to know one or more persons who were victims of homicide within the last 12 months, resulting in 255 characterizations of victims. These respondents' descriptions of the victims were used to estimate the relative incidence by sex, race, age, and geographic location (*15*). With respect to the last attribute, the victim was assigned to the respondent's geographic location. In the case of sex and region there are good approximations to the official statistics: disproportionately more males, more residents of the South, and fewer residents of the East (in particular, New England) are victims of homicide.

Table 2 presents cumulative AIDS data from CDC official statistics (*16*, *17*) and from the GSS 1988 survey. About 10% of the GSS sample claimed to know one or more persons with AIDS. The GSS 1988 survey closely reproduces the exceptionally strong gender imbalance in the disease and the age distribution reported by CDC. But in comparisons with respect to minority status and region there are sharp departures (*18*). The GSS data suggest that the white proportion is substantially higher than CDC reports and that a substantially greater share of the cases is in the midwestern region (*19*).

In addition, there is evidence that the white population is differentially sampled from the middle and upper social strata. In comparing three indicators of the socioeconomic status of the respondents (occupational prestige, subjective class identification, and educational attainment) and the likelihood of their knowing a homicide victim or a person with AIDS, strongly contrasting trends in the GSS data were found. All three indicators suggest that lower status

Table 1. Annual homicide data from official statistics (*12, 13*) and GSS 1988 (*9*). Some distribution (Distr.) percentages do not add to 100 because of rounding of numbers.

Characteristic	*UCR* 1986		*Vital Statistics* 1985*		GSS 1988† (weighted)		GSS 1988‡ (unweighted)	
	n	Distr. (%)	*n*	Distr. (%)	*n*	Distr. (%)	*n*	Distr. (%)
			Sex					
Male	14,455	75	15,066	76			121	78
Female	4,774	25	4,827	24			31	20
Unknown	28	0		0			4	3
Total	19,257	100	19,893	100			156	100
			Race					
White	10,199	53	11,163	56	142	56	99§	63
Black	8,509	44	8,282	42	95	37	48	31
Other	452	2	448	2	18	7	7	4
Unknown	97	1		0			2	1
Total	19,257	100	19,893	100	255	100	156	100
			Ethnic origin					
Hispanic	2,841	15			23‖	9	18	12
Non-Hispanic	12,868	67			232	91	136	87
Unknown	3,548	18					2	1
Total	19,257	100			255	100	156	100
			Age (years)					
10 or less	768	4	715	4			2	1
11 to 20	1,716	9	1,852	9			26	17
21 to 40	11,169	58	11,466	58			90	58
41 or older	5,150	27	5,797	29			35	22
Unknown	454	2	63	0			3	2
Total	19,257	100	19,893	100			156	100
			Region					
East	3,412	17	3,128	16	41	16	25	16
Midwest	3,941	19	3,873	19	70	27	41	26
South	8,760	42	8,778	44	106	42	64	41
West	4,500	22	4,202	21	38	15	26	17
Total	20,613¶	100	19,981¶	100	255	100	156	100

*These statistics are of all "homicides and legal interventions" (that is, deaths due to homicide and injury purposely inflicted by other persons including law-enforcement events acting in the line of duty). †The weighted data for GSS 1988 were calculated from a cross-tabulation of the total number of victims of homicide known to respondent, the race of the closest victim, and respondent's race. ‡Information on sex, race, ethnic origin, and age from GSS 1988 is based on the characteristics of the murder victim who was closest to the respondent. Race and ethnic origin for the GSS data come from a single variable with four categories: black, white, Hispanic, or other. Region is based on region where respondent is currently living. §Because both *UCR* and *Vital Staistics* code race and ethnic origin separately, we reassigned homicide victims identified as Hispanic in the GSS to one of the three racial categories by looking at how the victim was identified, respondent's race, and respondent's national origin. ‖The "weighted" data on ethnic origin were derived from a cross-tabulation of the number of homicide victims, the race of the closest victim, respondent's race, and whether or not respondent was of Hispanic origin. ¶The totals, 20,613 and 19,981, are different than the totals in the sex, race, ethnic origin, and age breakdown categories. They are considered the correct total numbers. The more specific information is only available on a smaller number of cases.

respondents are more likely to know a homicide victim than are higher status respondents. This result is consistent with what is known about homicide victimization generally (*20*). A reversal of this relationship is observed with respect to knowing persons with AIDS: higher status respondents are much more likely to know persons with AIDS than are lower status respondents. In fact, for respondents with a postgraduate education (n = 120), 23.3% know a person with AIDS, whereas only 6.7% reported that they knew a murder victim.

How could we explain the apparent undercount by CDC of white middle-class people with AIDS? We would point out that the CDC data rely on two reporting pathways differentiated by minority status and class. Middle-class white persons with AIDS are often diagnosed by private physicians (who are then expected to report these cases to the local health department), whereas poorer people are more often diagnosed during their contacts with public health agencies (hospitals, prenatal clinics, sexually transmitted disease clinics, and prisons). These lower status groups are thus likely to be in contact with a more stringent regime that registers the incidence of socially disapproved diseases. Given the highly stigmatizing nature of AIDS, it is not surprising that those persons with the financial wherewithal to do so use the private health care system that can provide them privacy and discreet handling of their affliction. The result is that the CDC monitoring system may seriously underestimate the extent of the disease in higher socioeconomic status groups.

Regarding the geographic distribution of AIDS cases, CDC figures imply that AIDS is a "coastal phenomenon" with the Midwest having a noticeably low percentage of cases relative to its population (Table 2). The GSS 1988 data suggest, however, that the Midwest has almost its proportionate share of cases and the East has substantially less than the CDC figures imply. Much has been made of the role of homosexual communities in the initial spread of the disease. Homosexual communities on each coast are communities of migrants from all parts of the country. One might then argue that the low proportions in the Midwest result from its high-risk population having moved to either coast for a more congenial social environment. Their friends and acquaintances back home might report them as part of their networks, thus explaining the higher percentage of reported cases by the GSS respondents in the Midwest. We cannot directly test this hypothesis, but the midwestern respondents do not differ appreciably from the other three regions in their descriptions of the nature of their social ties with persons with AIDS. Indeed, more than half of the reported AIDS cases in the Midwest, as elsewhere, are friends, co-workers, or neighbors of the respondents—all relationships that are likely to be geographically localized around the reporting respondent.

An alternative explanation for the higher incidence in the Midwest as reported in the GSS data is systematic underreporting from the Midwest to CDC. It is puzzling how a major metropolitan center like Chicago, the traffic hub of the nation with a full portfolio of urban problems, including those associated with drugs, should be so far out of line with the other major metropolitan areas in its AIDS caseload. At the present time the Chicago metropolitan area accounts for 31% of the Midwest's modest case count; it is clearly the major area for setting the AIDS case level in the region. Yet Chicago reports only 3.1 cases per 10,000 residents compared to 3.7 cases per 10,000 residents in the United States as a whole (*21*). Thus variations in local reporting requirements and procedures and general responsiveness of the health care system to the disease may produce a highly misleading picture of the national dimensions of the epidemic.

If the GSS results are correct, we conclude that the data provided to the CDC currently underestimate by a substantial margin the prevalence of AIDS in the white population of higher socioeconomic status relative to its prevalence in the minority populations, and underestimate the prevalence of the disease in the Midwest relative to its prevalence in the East. There are a number of possible explanations for these results. With respect to social and regional distributions, we speculate that the threshold for identifying and reporting the disease by official surveillance systems is relatively high when the disease is rare. Medical alertness to the disease and simple bureaucratic routines for reporting it are likely to increase as the disease becomes more prevalent. The elevated proportion of white cases suggests that there may be unre-

Table 2. Cumulative AIDS data from official statistics (*16, 17*) and GSS 1988 (*9*). Some distribution (Distr.) percentages do not add to 100 because of rounding of numbers.

Characteristic	CDC report, 7 March 1988		GSS 1988 (weighted)		GSS 1988* (unweighted)	
	n	Distr. (%)	n	Distr. (%)	n	Distr. (%)
			Sex			
Male	50,647	92			126	95
Female	4,520	8			5	4
Unknown	0	0			2	2
Total	55,167	100			133	100
			Race†			
White	32,999	60	167‡	72	93	70
Black	14,089	26	43	18	24	18
Hispanic	7,575	14	13	6	11	8
Other	504	1	9	4	3	2
Unknown	0	0	1	0	2	2
Total	55,167	100	233	100	133	100
			Age (years)§			
10 or less	886	2			0	0
11 to 20	234	0			5	4
21 to 40	36,990	67			96	72
41 or older	17,057	31			30	23
Unknown	0	0			2	2
Total	55,167	100			133	100
			Region‖			
East	23,947	39	44	19	30	23
Midwest	4,868	8	47	20	31	23
South	15,782	26	58	25	39	29
West	16,575	27	84	36	33	25
Total	61,172	100	233	100	133	100
Other	1,028					
Total	62,200					

*Information on sex, race or ethnic origin, and age in the GSS 1988 is based on the characteristics of the person with AIDS who is closest to the respondent. Six respondents reported that the person with AIDS they knew best was a patient and are excluded from the present analysis. Region is based on region where respondent is currently living. †The CDC categories are white, not Hispanic; black, not Hispanic; Hispanic; and other/unknown (other includes Asian/Pacific Islander and American Indian/Alaskan native). ‡The weighted data for the GSS 1988 were calculated from a cross-tabulation of the total number of people with AIDS known to respondent, the race or ethnic origin of the closest victim, respondent's race, and whether respondent is Hispanic or not (primary national origin of Mexican, Puerto Rican, or other Spanish). §Age distribution for data from CDC is actually less than 13 years, 13 to 19, 20 to 39, and 40 and above. ‖Region data are from the CDC report of 16 May 1988 (*17*). The Other category, which accounts for about 2% of the total cases, is made up of Puerto Rico, the Virgin Islands, Guam, and the Trust Territory of the Pacific Islands.

ported transmission among populations outside the major urban centers where the disease is currently believed to be concentrated.

Methodological issues qualify the GSS findings. The sample size is small and thus our estimates are imprecise. Larger samples would permit close inspection of the distribution of cases across geographic regions and facilitate multivariate analysis. With more details about the persons identified with AIDS, we could have avoided inferring the geographic location of the person with AIDS, for instance. More methodologically oriented network studies would permit us to estimate the size of personal acquaintance networks, knowledge of particular attributes of acquaintances, and effects of network density on accuracy of reports. More generally, we need a more accurate view of the social epidemiology of AIDS; for without it, public health measures may be misdirected in audience, geography, and timing.

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18. It would be desirable to construct confidence intervals to assess the statistical significance of observed differences. It is not at all clear to us what sampling theory would be appropriate for the case in hand because we are not dealing with a "standard" problem in estimation from a well-defined population. We thus chose not to try to make such estimates because they are likely to be misleading or wrong.
19. There are a number of surveys that have asked whether respondents knew someone with AIDS. One such study was a telephone survey with random digit dialing done in Chicago from April to July 1987 [see D. G. Ostrow, S. Michaels, G. A. Albrecht, "Information and misinformation: The state of knowledge, attitudes and beliefs about AIDS in the Chicago metropolitan area general population" (preliminary report to the Chicago Department of Health's Comprehensive AIDS Prevention Education Program, Chicago, 1988)]. We compared the results from this telephone survey to the official reports on AIDS cases collected by the Chicago Department of Health. The result is strikingly similar to the national comparison: the survey data indicate a higher percentage of white cases than the official statistics (approximately 68 versus 58%) and a lower percentage of black cases (18 versus 33%).
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22. We gratefully acknowledge the helpful comments and suggestions of N. Bradburn, P. E. Converse, W. Coppelson, S. Hellman, R. L. Berkelman, J. Joseph, E. Kitagawa, R. Leo, M. Morris, S. H. Preston, M. Siegler, and T. W. Smith. The GSS is funded by NSF; the 1988 questions pertaining to sexual behavior and acquaintance with AIDS and homicide victims were funded by the National Opinion Research Center (NORC). Partial support for this research was provided by NSF through the National Data Program for the Social Sciences, NORC, and the National Institute of Child Health and Human Development (contract NO1-HD-8-2907).

14 November 1988; accepted 28 March 1989

Localization and Mobility of ω-Conotoxin–Sensitive Ca^{2+} Channels in Hippocampal CA1 Neurons

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Voltage-dependent Ca^{2+} channels (VDCCs) are modulators of synaptic plasticity, oscillatory behavior, and rhythmic firing in brain regions such as the hippocampus. The distribution and lateral mobility of VDCCs on CA1 hippocampal neurons have been determined with biologically active fluorescent and biotinylated derivatives of the selective probe ω-conotoxin in conjunction with circular dityndallism, digital fluorescence imaging, and photobleach recovery microscopy. On noninnervated cell bodies, VDCCs were found to be organized in multiple clusters, whereas after innervation the VDCCs were concentrated and immobilized at synaptic contact sites. On dendrites, VDCC distribution was punctate and was interrupted by extensive bare regions or abruptly terminated. More than 85% of the dendritic VDCCs were found to be immobile by fluorescence photobleach recovery. Thus, before synaptic contact, specific mechanisms target, segregate, and immobilize VDCCs to neuronal cell bodies and to specialized dendritic sites. Regulation of this distribution may be critical in determining the firing activity and integrative properties of hippocampal CA1 neurons.

THE INFLUX OF Ca^{2+} THROUGH voltage-dependent calcium channels (VDCCs) is important in the modulation of neuronal function (*1*). These Ca^{2+} influxes are often localized to discrete regions of the neuron (*2*) and are associated with regulation of neurotransmitter release (*3*), activation of Ca^{2+}-dependent enzymes (*4*), changes in neuronal excitability (*5–7*) and morphology (*8*), and possibly epileptogenesis (*9*) and in the neuronal conditioning phenomena implicated in learning and memory (*7, 10*).

Three major classes of neuronal VDCCs, L, N [both designated high voltage–activated (HVA)], and T [designated as low volt-

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