

THE DIFFUSION OF AIDS AND SOCIAL DEPRIVATION IN NORTH CAROLINA

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Introduction

The dominant public perception of AIDS in the United States is that it is a problem for persons living deviant, socially unacceptable lifestyles. Bombarded by television images and print media accounts of the AIDS epidemic among male homosexuals and intravenous drug users living in large cities, many Americans have concluded AIDS is a problem only for socially marginalized populations. An examination of the data, however, reveals that with the spatial diffusion of AIDS the risk of contracting the disease has spread out of earlier AIDS clusters into virtually all strata of American society. And, in fact, AIDS has already become a serious problem for the economically deprived.

As the disease has progressed during the past five years, the linkage between AIDS and poor and socially disadvantaged Americans has become stronger. While AIDS and HIV infection remains a serious public health concern for affluent, white, homosexual or

As AIDS has diffused through our population over the past five years, the linkage between the disease and the poor and socially disadvantaged has grown stronger

bisexual males, it is equally important for young, poor, African American, white, and Native American women and men living in rural and urban areas. The spread of AIDS into and among disadvantaged populations comes as no surprise to anyone familiar with the patterns of disease and health care systems in the U.S. Disadvantaged populations, living in urban ghettos or rural areas, have greater medical and health problems and less access to medical services than other Americans.

The major purpose of this paper is to offer an analysis of the geographical spread of AIDS within North Carolina, with particular emphasis on the linkage between the disease and social deprivation. Our research draws upon the earlier diffusion modeling of AIDS by the senior author, integrating it with research themes from social geography.

Geography of AIDS

While the disease, Acquired Immune Deficiency Syndrome (AIDS) entered the United States during the late 1970s, it did not start spreading through North Carolina until the mid-to-late 1980s. The geographical spread of AIDS within the United States has been documented (Shannon and Pyle, 1989; Shannon, Pyle and Bashshur, 1991). That spread within the United States followed an ascertainable sequence of events. During the early phases of the AIDS infusion into

the U.S., HIV infection was spread by individuals who frequently used international air travel. Clusters of HIV infections and AIDS cases initially appeared within very specific neighborhoods of large cities. Outbreaks of AIDS among homosexual and bisexual males residing in or frequenting these particular neighborhoods of New York, San Francisco, Los Angeles, Miami and Houston made for spectacular media coverage. Epidemic reconstruction has led to the conclusion that the HIV epidemic had spread from these urban core nodes much more quickly than had been initially surmised. Eventually, a major regional core area and secondary diffusion nodes developed within the United States by the mid-1980s (Gould, 1989).

Clearly, some of these regional diffusion nodes were more extensive than others. The larger of these nodes were contained within New York, San Francisco and Los Angeles, and they were referred to as "incubator districts." Other regional nodes of HIV diffusion included an area extending outward from southern Florida that eventually spread into Georgia and South Carolina. As these AIDS core areas expanded, a well defined fringe and periphery could be

Regional AIDS 'incubator districts' developed in New York, San Francisco, and Los Angeles by the Mid-1980s

identified by the late 1980s. By 1985, North Carolina was still on the periphery of the major AIDS epidemic within the United States. In other words, no national AIDS diffusion core area had developed within North Carolina during the 1980s.

Information supplied by the North Carolina Department of Environment, Health and Natural Resources indicates that by the end of 1990 there were nearly 1700 cases of AIDS reported for the state of North Carolina since the beginning of the national epidemic. By the end of 1990 the cumulative national AIDS rate within the United States was 64 cases per 100,000 persons. Comparatively, for North Carolina, the cumulative rate was 28 per 100,000.

The AIDS epidemic within North Carolina from 1985 to 1990 can be divided into two distinct periods. The first of these, including

1985, 1986 and 1987, can be referred to as the infusion stage. During this three-year period, HIV infection and AIDS had become "seeded" within some counties of the state. By the end of 1987, nodal areas for the future proliferation of the disease had been established. The sequence of maps contained within Figure 1 shows this progression. For example, there were few cases reported in 1985 and they appeared to be somewhat scattered; however, most counties with larger cities were represented in early reporting. Cumulative AIDS reporting per 100,000 by 1986 indicated geographical

Absent a national diffusion core area in 1985 it was clear that North Carolina had seen the AIDS epidemic evolve to the point of having several 'seeded' counties by 1987

patterns that continued for several years. By 1987 some of the larger counties in the state, Mecklenburg and Wake, for example, had seen the formation of certain nodes for diffusion.

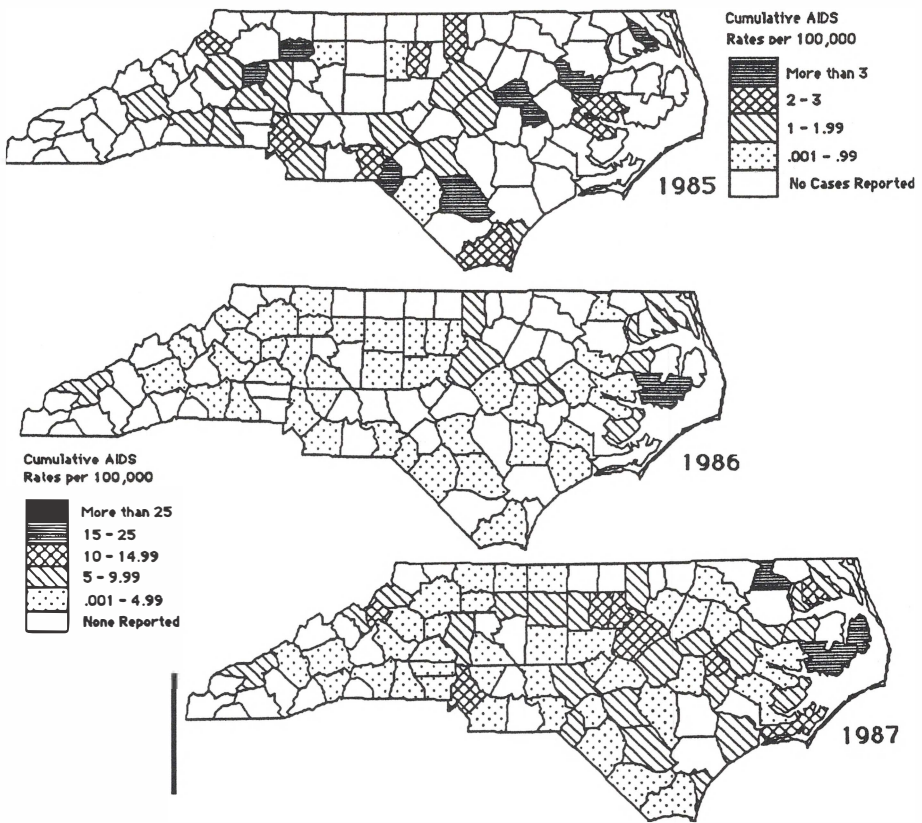


Figure 1. North Carolina: The AIDS infusion stage, 1985, 1986, 1987.

(Reader should note that the legend for 1985 differs from the legend for 1986 and 1987).

North Carolina's 'second wave' saw the spatial diffusion of the disease from the AIDS corridor of the urban crescent to many rural eastern coastal plains and tidewater counties

The subsequent period of AIDS diffusion is referred to here as the "second wave." Shown within the sequence of maps depicted as Figure 2, this second wave included the continued growth of AIDS reporting within major metropolitan areas as well as the formation of an AIDS corridor essentially mirroring the Piedmont Urban Crescent extending from Charlotte to Raleigh. The cumulative AIDS reporting for 1988 reflects this pattern. By 1989, it was clear that another phenomenon had begun to show up. Many counties in the eastern part of North Carolina had reported rates that by then were somewhat higher than counties in the more western parts of the state. By 1990 this pattern became even more pronounced

as the heaviest reporting of AIDS cases in the state included not only the previously defined Piedmont Urban Crescent but many more rural counties in the eastern part of the state as well.

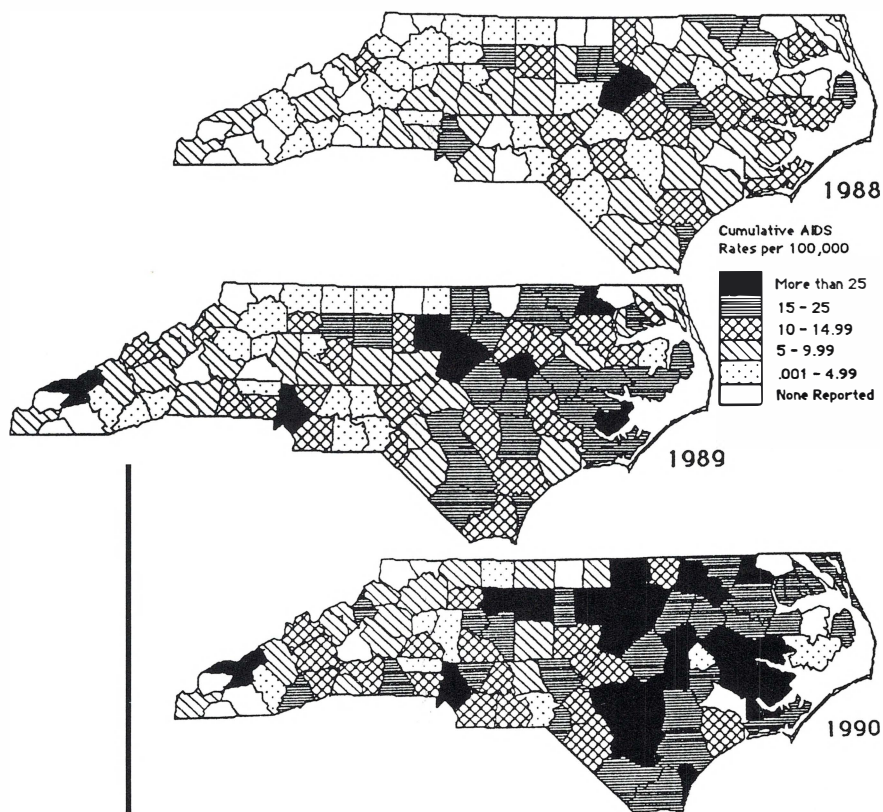


Figure 2. North Carolina: AIDS, the second wave stage, 1988, 1989, 1990.

AIDS and Metropolitan Counties

As the national AIDS epidemic continued to increase in intensity during the late 1980s it became increasingly apparent that within many parts of the country metropolitan areas had functioned as nodes for diffusion of AIDS into surrounding regions. Many parts of the United States more urbanized than North Carolina had experienced the AIDS epidemic much earlier, as previously indicated. In Ohio, for example, concentrations of AIDS cases within metropolitan regions were already thoroughly widespread by 1990. The same was true in California where AIDS had spread outward from the Los Angeles and San Francisco metropolitan areas to include such other urban centers as San Diego, Oakland and Anaheim. Likewise, in Texas and Florida the disease was already more widespread than within North Carolina by the late 1980s. The Miami metropolitan area had reported about 30% of the cumulative number of AIDS cases

by 1990 and another 16% had been reported from Fort Lauderdale. By 1990, the West Palm Beach and Tampa areas had also reported more than 10% of that state's cases of AIDS, with more than 5% reported from Jacksonville and Orlando. The Texas concentrations were still centered somewhat around Houston and Dallas by 1990, but other Texas cities were experiencing decreased reporting of AIDS. These included San Antonio, Austin and Fort Worth.

In general, by the early 1990s about 80% of all of the AIDS cases that had ever been reported within the United States were within metropolitan areas of a half-million people or more. Within states where the disease had become endemic during the early 1980s, AIDS was clearly more widespread than for some parts of the country. Still, urban concentrations within North Carolina could be identified. The information contained within Table 1 consists of reporting and computed AIDS rates for the most metropolitan counties within North Carolina for the time period 1985 to 1990. By 1990, about 55% of the reported AIDS cases in North Carolina were from the three largest metropolitan areas. The Raleigh and Charlotte metropolitan areas each contained about 22% of the total AIDS cases reported. Greensboro accounted for about 15% of the cases of AIDS, and the remaining 42% were distributed throughout the rest of the state. The information contained within Table 1 also presents an interesting comparison with respect to rates of increase during the study time period. One metropolitan county, Durham, was the only county reporting a cumulative AIDS rate more than the national average by the end of 1990 (67.6 as compared to 64 nationally). Interestingly, most of that increase took place from 1988 to 1990. Wake County (containing Raleigh) ranked second within the state by the end of 1990 with a rate of 52 per 100,000. By contrast, Mecklenburg County containing Charlotte the largest city of North Carolina, had a cumulative rate of 42.2 per 100,000 by the end of 1990, a rate of about two-thirds the national average.

The conventional wisdom that a systematic relationship between the size of urban places and the magnitude of the disease problem does not exactly hold true for the Carolinas. The Durham

County situation also appears to be somewhat complex. The cumulative rate for Durham County nearly doubled from 1988 to 1989. Duke University with its major medical school and research center is located in that county. Durham County also has the highest ratio of physicians to general population in the state. However, there are also some very low income urban ghetto type areas within Durham County. There appears to be some relation between the recent increase of numbers of AIDS cases in that county and the presence of the medical-research complex.

A combination of low income urban, medical research complexes and universities appears related to the increasing incidence of AIDS in North Carolina's urban centers

The medical school argument, however, must be approached with a great deal of caution. It should be noted that Orange County, containing Chapel Hill, also has experienced somewhat substantial recent increases in the reporting of AIDS. Forsyth County, housing the medical school at Wake Forest University, reported a cumulative rate of about half that of the United States through 1989. Recent reporting shows some rather dramatic increases within that county also. The circumstances within Durham County however is probably better understood when viewed in combination within AIDS reporting for Wake County. Wake County includes Raleigh with some poor urban ghetto areas as well as North Carolina State University. When many aspects of the entire Research Triangle Area are considered, including, the several medical research complexes contained within universities and the Triangle along with the presence of a large manufacturer of AIDS medication, the geographical concentrations and build up of AIDS in the Triangle Region counties should be no great surprise. It is suggested here that many already afflicted with AIDS have been attracted to this large treatment complex.

County (Central City)	1990 Population	1985 Cases	1985 Rate	1986 Cases	1986 Rate	1987 Cases	1987 Rate	1988 Cases	1988 Rate	1989 Cases	1989 Rate	1990 Cases	1990 Rate
Mecklenburg (Charlotte, NC)	511,433	11	2.200	15	3.000	64	12.800	115	23.000	170	34.000	221	42.2
Wake (Raleigh, NC)	423,380	7	1.750	20	5.000	52	13.000	102	25.500	156	39.000	208	52.0
Guilford (Greensboro, NC)	347,420	3	.909	8	2.424	23	6.967	37	11.212	67	20.313	121	36.7
Cumberland (Fayetteville, NC)	274,566	4	1.482	11	4.074	24	8.888	40	14.815	56	20.741	71	26.3
Forsyth (Winston-Salem, NC)	265,878	1	.385	7	2.692	22	8.461	42	16.154	64	24.615	98	37.7
Durham (Durham, NC)	181,835	0	0	7	4.118	23	13.529	38	22.353	72	42.353	115	67.6
Buncombe (Asheville, NC)	174,835	2	1.118	3.	1.765	5	2.941	9	5.294	15	8.823	25	14.7
New Hanover (Wilmington, NC)	120,284	2	1.739	3	2.608	10	8.699	18	15.652	27	23.478	35	30.4

Table 1. Cumulative Reporting of AIDS Case and Rates per 100,000 in North Carolinas' Most Metropolitan Counties: 1985-1990*

Source: U.S. Bureau of Census, North Carolina Department of Environment, Health and Natural Resources.

*Populations based on numerical extrapolation between 1980 and 1990 Census figures.

AIDS and Poverty in North Carolina

The assumption is made here that during the first several years of the infusion stage of AIDS in North Carolina, the disease was spread primarily by bisexual and homosexual males. Thus, scattered counties, some parts of larger cities, and flamboyant resort areas such as Wilmington and the area around Asheville showed up with some early reporting. During the second wave, more and more cases of AIDS could be attributed to needle sharing during IV-drug abuse as well as prostitution. The disease subsequently became more and more of a problem in some ghetto portions of the larger cities. Such a sequence of events appears to have taken place within the Charlotte metropolitan area. Mecklenburg County contains the city of Charlotte where most of the early AIDS cases were located. It should be noted that the disease spread quickly to some poverty pockets within Charlotte as well as to York County, South Carolina ghetto areas. In many respects, a geographical distance decay relation can be identified within Mecklenburg County. This AIDS decline with distance

Charlotte has functioned as a core area for a geographical diffusion pattern that follows a typical distance decay relation

from Charlotte is similar to that reported in many metropolitan areas of the United States as early as 1989 (Gardner et al.). A similar circumstance was uncovered for Los Angeles (Bowen and Mladenich, 1990). The pattern seen within the Charlotte area underscores broader aspects of the infection disease complex within the state. It now appears to be emerging in the early 1990s as a monumental social problem. As with most other cities, Charlotte has functioned as

a core area for diffusion into the surrounding hinterland.

Within North Carolina, in general, the second wave of AIDS diffusion included all of the phenomena identified within Charlotte within a broader context in the entire Piedmont urbanized corridor. The basic difference within North Carolina as compared to other areas however was the tremendous diffusion of AIDS into poor rural counties. By 1990, a broad band of rural counties in Eastern North Carolina had AIDS rates equal to or in some instances higher than the rates found in the Piedmont. Among these counties are some of the

But in its progression into the poor, rural counties of eastern North Carolina the AIDS epidemic has shown extraordinary though not unexpected strength

poorest and most disadvantaged areas in the state, including Bladen, Halifax, and Hertford counties.

To those familiar with the region, the spread of AIDS into rural Eastern North Carolina is not unexpected. It is a consequence of traditional economic and social relations in this largely agricultural area. Drawn by the lure of higher wage jobs and economic opportunities, the urban centers of the Piedmont and the smaller urban areas of the Coastal Plain have historically attracted the rural poor. Although

their jobs and residences are in cities, such as Raleigh, Charlotte, Norfolk, Elizabeth City or Wilmington, many out-migrants continue

to have strong family ties "back home." With relatively short travel distances and an excellent highway system, regular movement between rural and urban areas is easy.

During the 1980s, a period when economic restructuring resulted in high unemployment in the manufacturing sector and a stagnating agricultural economy, the movement of rural residents to cities in search of work, and the return of unemployed urban poor to rural areas was stimulated. At a time when HIV was spreading in urban ghettos, the transference of the disease into rural Eastern North Carolina was accelerated by the negative economic conditions.

As AIDS continues to build up within urban areas of North Carolina, as well as the eastern coastal plain, two major aspects of social deprivation stand out. The first is a poverty-related syndrome

Once introduced into a community caught up in the poverty-syndrome the AIDS virus is easily transmitted

consisting of the complex association among such problems as unemployment, depression, alcohol and drug abuse, infant mortality, prostitution and the overall diffusion of disease including the resurgence of tuberculosis (Pyle, 1990). Once introduced into a community caught up in the poverty-syndrome, the AIDS virus is easily transmitted within the group. Consequently, it is inevitable that AIDS

rates will continue to increase within ghetto areas of many North Carolina cities.

The second general facet of the problem, clearly not unique to North Carolina but still very real, consists of a similar poverty-AIDS complex scattered among the multitude of rural settlements within the Coastal Plain. HIV carriers returning home from urban ghettos are the likely sources for the diffused virus. Disadvantaged rural communities suffering from the poverty-related syndrome are conducive environments for the disease. AIDS is spreading at a very rapid rate in many rural coastal North Carolina counties. In this regard, North Carolina is not unique. The general trend throughout the U.S. in the early 1990s is that the high rates of increase in HIV infection are occurring in rural areas.

Given this problem, a conceptual model of the continued diffusion of AIDS within the Carolinas theoretically takes the form of a "U-shaped" curve as seen in Figure 3. Thus, high rates of AIDS expansion will continue within some of the poverty pockets of larger urban centers of the Piedmont. The "newer frontiers" for AIDS diffusion will continue to become more pronounced as poverty areas of the eastern Coastal Plain begin to reel from the impact of the epidemic. As more and more of the original AIDS patients unfortunately continue to transpire, newer victims will be younger and younger and the male to female ratio will approach unity.

The dual nature of the AIDS poverty-syndrome is additionally highlighted by lower reported AIDS rates from suburbs, small towns

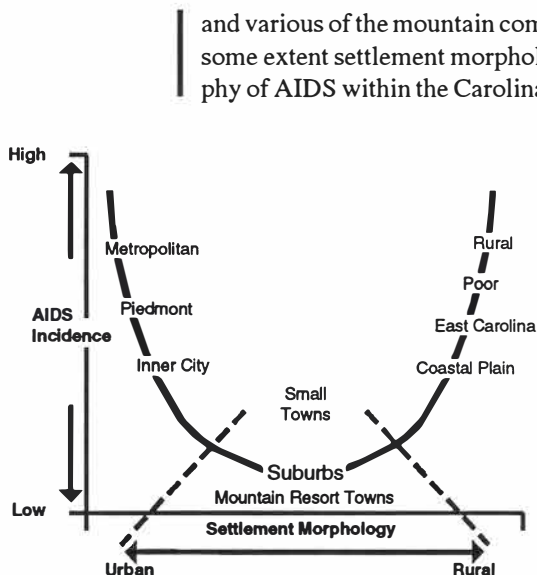


Figure 3. AIDS Incidence in North Carolina in Relation to Settlement Morphology

The theoretical U-shaped AIDS diffusion curve emphasizes continuing expansion of the virus within the larger urban centers and the emergence of the 'newer frontiers' of AIDS in the rural poverty areas.

and various of the mountain communities. These data suggest that to some extent settlement morphology does seem to reflect the geography of AIDS within the Carolinas. However simplistic this model, it still points to the need to consider such aspects of settlement pattern when developing mathematical models for the diffusion of AIDS within North Carolina. Definitely, many of the classic aspects of spatial diffusion, i.e. (1) downward hierarchical movement; (2) distance-decay relationships; and (3) the numerical attraction of population mass with respect to distance form additional nodes, appear to have functioned within North Carolina during the 1980s.

Public Policy Implications

Given the characteristics of the HIV and the manner in which it is spread, the diffusion of the virus into young, sexually active populations has had and will continue to have profound effects on disadvantaged groups and communities in North Carolina as well as other parts of the U.S. In communities already wrestling with the problems of poverty and disadvantage, AIDS is a cruel complicating factor. In communities already underserved by the health care system, the introduction of AIDS and the costs associated with the care and treatment of HIV positive patients may become an unaffordable expense.

For middle class and wealthier communities the problems faced by AIDS affected neighbors cannot be ignored. The disease is not something that will "burn itself out" or "go away." Effective, responsible treatment of AIDS will require all citizens to work together.

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