



A Geospatial Analysis of CDC-funded HIV Prevention Programs for African Americans in the United States

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Abstract

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Keywords

African Americans; AIDS (Disease) – Prevention; Community-based organizations; Geospatial analysis; GIS; Health promotion; HIV infections – Prevention; HIV prevention services; Racial/ethnic minorities; Rural populations; Southern states; United States

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Abstract

Given the increase in HIV/AIDS infection rates among racial and ethnic minorities, particularly African Americans, this study was undertaken as part of a larger research effort to examine the distribution of HIV prevention services focusing on African American populations within the United States. Data were gathered via a national survey of community-based organizations (CBOs) funded by the Centers for Disease Control and Prevention (CDC). A geocoded national database was constructed to identify, locate, and map these HIV prevention programs. A total of 1,020 CBOs responded to the survey, yielding a response rate of 70.3%. These CBOs administered a total of 3,028 HIV prevention programs. Data describing intervention types and persons served, combined with the address and service area of responding CBOs, were integrated with census data (2000) and analyzed by using a geographic information system (GIS). The results of our national level analysis show that HIV prevention services for African Americans have fair coverage where African Americans comprise a substantial proportion of the population in urban areas in northeastern states, but that HIV prevention services for African Americans are inadequately distributed in the southeastern states. A local-level analysis was conducted for Alabama, where 68% of HIV/AIDS cases are among African Americans. Specific interventions such as street and community outreach, health communications, and public information are fairly well provided to African Americans in more urban cities in Alabama, however, individual- and group-level interventions have poor coverage in rural areas where a large percentage of African-Americans live. Overall, our study illustrates that the use of GIS adds value when used with other data sources to provide prevention services that are accessible to the populations most in need.

Key Words: Geospatial analysis; GIS; HIV prevention services; Community-based organizations; African Americans; Racial/ethnic minorities

Introduction

During 2001-2004, in nearly every demographic and transmission category, the largest percentages of HIV/AIDS cases diagnosed were among African Americans. Disparities were observed in all demographic and transmission groups; however, they were especially pronounced among women, children, and persons with high-risk heterosexual contact. Blacks accounted for the highest percentages and rates of cases for both males and females in the high-risk heterosexual contact transmission category and for the majority of cases of HIV attributed to perinatal transmission (CDC, 2006). By region, African Americans accounted for the majority of diagnoses in the South (47,497 [54%]) and Northeast (23,674 [53%]). More HIV/AIDS diagnoses were made for black males than males of any other racial/ethnic population in the South (29,532 [48%]) and the Northeast (14,104 [47%]). More black females were diagnosed with HIV/AIDS than females from other racial/ethnic groups in the South (17,965 [72%]), Northeast (9,570 [65%]), and Midwest (2,565 [64%]) (CDC, 2006). CDC has introduced programs and HIV prevention interventions to increase HIV-testing and reduce high risk behaviors among populations at risk for HIV infection (CDC, 2003a; CDC, 2003b). Ensuring the accessibility of these to help address disparities, especially in the rural South, is critical.

The reporting framework established by CDC's Evaluation Guidance (CDC, 2001a; CDC, 2001b) gives CDC-funded providers a common vocabulary for interventions and target populations. Yet these data yield limited information about the availability and accessibility of these interventions to their intended recipients. In an effort to provide answers to some of these questions, we constructed a national geo-referenced database of HIV prevention interventions provided by CDC-funded community-based organizations (CBOs). This database is maintained in a geographic information system (GIS) and was created to supply information about CBO locations, HIV prevention interventions provided, and their geographic service areas.

McLafferty (2003) explains the importance of understanding geographic variations in need, access and utilization: it helps program managers make important decisions about resource allocation. Other examples of GIS health services research provide information on neighborhood- and city-level variation (Hendryx, Ahern, Lovrich, & McCurdy, 2002; Hyndman & Holman, 2001); meeting the needs of an underserved population (Phillips, Kinman, Schnitzer, Lindbloom, & Ewigman, 2000); disparity in Medicare expenditures (Hirth, Tedeschi, & Wheeler, 2001); and access, utilization, socioeconomic inequalities, and public health disparities (Fulcher & Kaukinen, 2005; Kistemann, Dangendorf, & Schweikart, 2002; Krieger, Waterman, Chen, Soobader, & Subramanian, 2003; Parker & Campbell, 1998). These

applications of GIS to public health provide very important lessons and are therefore timely and appropriate given the impact of the HIV/AIDS epidemic. The potential of GIS has been recognized by the Department of Health and Human Services (DHHS). The Healthy People 2010 Objective 23-3 is to “increase the proportion of all major national, state, and local health data systems that use geocoding to promote nationwide use of geographic information systems (GIS) at all levels” (DHHS, 2000). GIS could be used to support planning that responds to population needs; to create data resources for use by state health departments, CBOs, capacity-building assistance providers, and CDC; and, integrated with other data collection activities currently underway at CDC and DHHS, to evaluate gaps in service accessibility and availability and inform HIV prevention and care planning (Whitmore, Zaidi, & Dean, 2005).

Based on these lessons in other areas of health and CDC’s expansion of its capacity- building initiatives to focus on racial and ethnic minorities, in particular African-Americans (CDC, 1999), funding was made available for a geospatial analysis of CDC-funded HIV prevention services. In this paper, we describe the results of a spatial analysis of the service distribution of CDC-funded HIV prevention interventions directed at African American populations, and the implications for using GIS as a tool to complement other planning methods to address disparities for HIV prevention.

Data and Methods

We used data from CDC’s HIV Prevention Services Database for mapping and descriptive analyses of HIV prevention services to African Americans at the national level and at a more local level, using Alabama as a case study. This database is maintained within a GIS. A previous paper by Hanchette, Gibbs, Gilliam, Fogarty and Bruhn (2005) provides a technical description of the development of the database and discusses the benefits of using GIS for health services research. Data were collected via a questionnaire that was mailed to all HIV prevention service providers funded either directly by CDC or indirectly through cooperative agreements with state or local health departments during fiscal year 2000. The survey instrument consisted of six questions that were used to collect information about intervention type, risk population, race/ethnicity of populations served, funding source, geographic units comprising the service area, and the geographic distance within which these services were located. Response categories for the non-geographic questions are shown in Table 1.

Table 1. Response categories for interventions, risk populations and race/ethnicity of persons served.

Intervention Type	Risk Populations	Race and Ethnicity
<ul style="list-style-type: none"> • Individual-level interventions • Group-level interventions • Street and community outreach • Prevention case management • Community-level interventions • Health communications/public information • Counseling, testing, referral, and partner notification 	<ul style="list-style-type: none"> • Men who have sex with men (MSM) • MSM/intravenous drug users (IDU) (and other drug users) • IDU • Heterosexual • Mother with/at risk for HIV • General public 	<ul style="list-style-type: none"> • African American • American Indian or Alaska Native • Asian • Native Hawaiian or Other Pacific Islander • Hispanic or Latino • White • More than one race^a • Race unknown

^arefers only to individuals of more than one race/ethnicity

Response categories for intervention types and persons served were consistent with those of CDC's Evaluation Guidance (CDC 2001a). For race and ethnicity, respondents were asked to report categories based on the US Census Bureau (2000) classifications, which included the new category for persons of more than one race/ethnicity. For street and community outreach activities, respondents were instructed to describe the area in which the interventions took place instead of the area where the persons served lived.

Service area definitions were based on geopolitical boundaries (Simpson, DesHarnais, Jacobs, & Menapace 1994). Respondents identified the states, counties, cities, ZIP codes and other administrative units in which services were provided. A full description of the methods used in this study, including follow-up with non-responders, can be found in Hanchette et al. (2005).

Results

All survey data were stored in an Access database and integrated with a series of spatial data sets for subsequent mapping and analysis using ArcGIS software (Environmental Systems Research Institute, Redlands, CA). Of the 1,420 CBOs that were mailed surveys, 1,020 (70.3%) responded to the survey. These CBOs reported on a total of 3,028 HIV prevention programs. Here, we report the results of analyses completed by using data describing intervention types, the racial and ethnic category African American, and the service area specified as the area where the majority (roughly 80%) of people receiving the prevention program live.

National-Level Analysis

As shown in Figure 1, African Americans in the United States congregate in the northeastern (excluding New England) and southern states, including Florida and the eastern part of Texas. California and Illinois also have large African American populations. African Americans are located in areas with high AIDS rates, e.g., Miami and New York (two of the five metropolitan statistical areas [MSAs] with the highest AIDS rates). In addition, the location of African Americans corresponds to the concentration of AIDS along the eastern seaboard from Maryland to New York.

Figure 1. African American population by state, 2000.

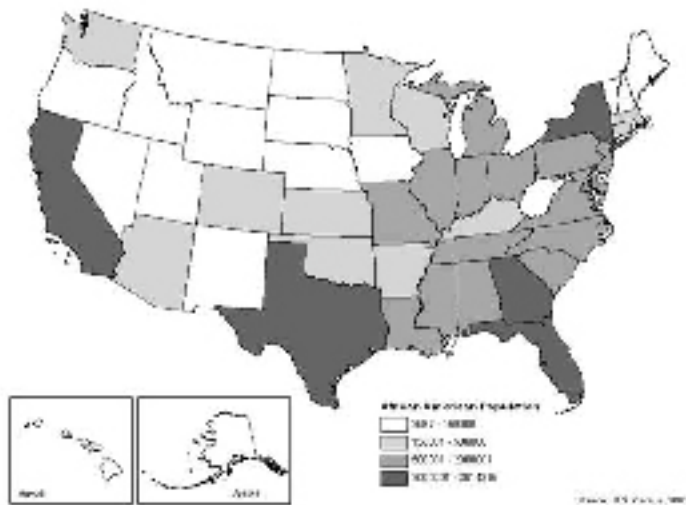


Figure 2 shows the geographic service areas of CBO HIV prevention programs in which African Americans were the majority of persons served by a given program, for all intervention categories combined. Some of the patterns are consistent with the heavily urban black population in the United States; others are not (Figure 1). The number of African Americans is low in the northwestern United States (2,692–190,267 persons per state) (US Census, 2000). The resulting low geographic coverage of services in this region reflects this. In Portland, Oregon, and Seattle, Washington, CBOs that are directly or indirectly funded by CDC offer all interventions to African Americans, except prevention case management (PCM).

Some states with low numbers of African Americans provide statewide HIV prevention services for specific intervention categories. These include Arizona, Wyoming, Nebraska, North Dakota, Minnesota, West Virginia, Vermont, and New Hampshire.

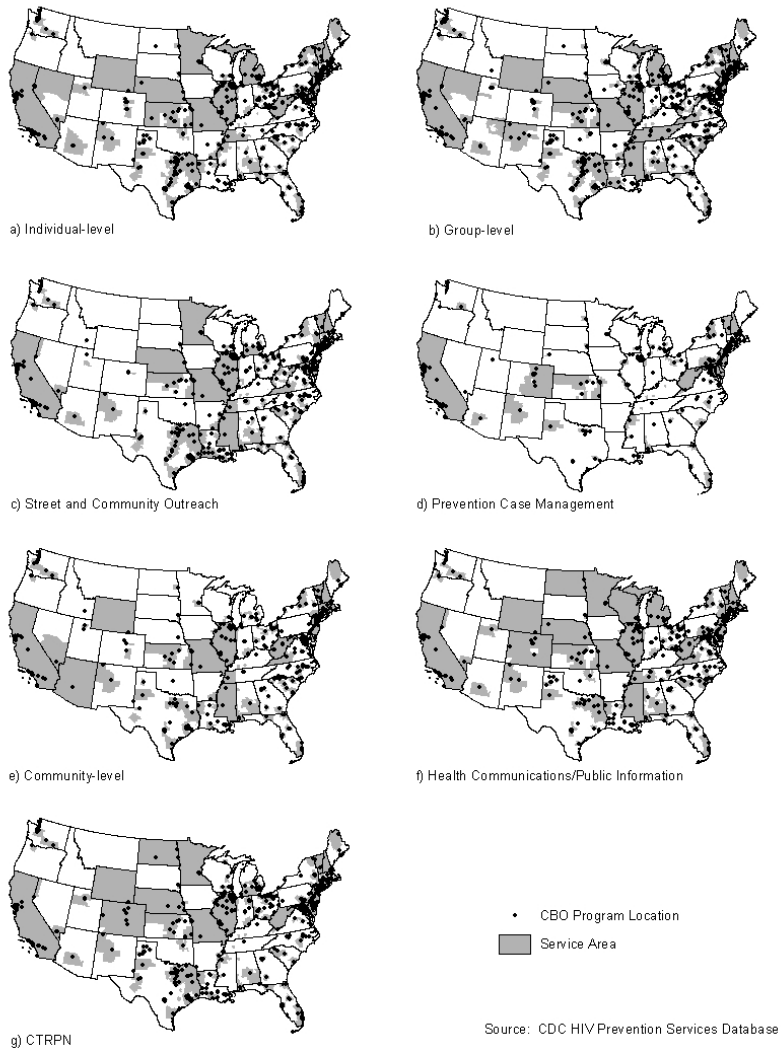
Figure 2. HIV Prevention Services to African Americans



The greatest concern, however, is accessibility to prevention services for states with large African American populations but little geographic coverage. This is most notable in the southeastern states, where the African American population is not as concentrated in major metropolitan areas as it is in some of the northeastern states. This raises the issue of equity which is a difficult concept to measure.

The distribution of geographic service areas of HIV prevention programs can provide more insight into gaps in coverage of CDC-funded programs than actual program locations, as the latter are represented by a single address. We now examine the geographic distribution of the 7 specific intervention categories (listed in Table 1) to African Americans. Figure 3 shows the CBO program locations and geographic service areas for each of these interventions. Alaska, Hawaii and Washington, D.C. are not shown on these maps, due to scale, but are discussed briefly at the end of this section.

Figure 3. CBO program locations and geographic service areas, by intervention category.



Individual-level Interventions

Figure 3a shows the distribution of individual-level interventions to African Americans. The match between geographic service areas for these interventions and state-level population distributions is concentrated in New York, New Jersey, and Maryland and in large metropolitan cities such as

Philadelphia, Detroit, Chicago, Houston, Dallas, Los Angeles, San Francisco, and Denver. States with concentrated populations of African Americans but with less accessibility to individual-level interventions are the southern states (Alabama, North Carolina, South Carolina, Georgia, Virginia, Florida, Tennessee, Mississippi, and Louisiana) excluding eastern Texas.

Group-level Interventions

The availability of group-level interventions (Figure 3b) closely mirrors that of individual-level interventions, particularly important because persons identified with a high risk for HIV infection and those with HIV-infected persons are often recruited from service areas providing individual- and group-level interventions. Both individual- and group-level interventions have less coverage in the southern states except for Mississippi and Tennessee, which provide fair coverage for African Americans through both directly- and indirectly-funded CBOs.

Street and Community Outreach and Community-level Interventions

Street and community outreach serve, for the most part, as recruitment for individual- and group-level interventions. Therefore, the geographic distribution of street and community outreach interventions to African Americans (Figure 3c) shows strong similarities to those for individual- and group-level interventions. The distribution of these services overlaps with community-level interventions, as shown in Figure 3e. CBOs in major metropolitan areas – areas with high incidence of HIV – offer community-level interventions. California, southern Nevada, Arizona, Wyoming, and Missouri offer widespread community-level interventions to all racial/ethnic minority populations including African Americans.

Prevention Case Management

HIV prevention programs that provide prevention case management to African Americans have the smallest geographic coverage of all interventions (Figure 3d). This is an intensive, high-resource intervention offered to persons who are HIV-positive. Fewer CBOs offer these services, and those that offer them are located in the major metropolitan areas of New York, New Jersey, Maryland, Illinois, and Michigan. California and many of the small states in the Northeast (Vermont, New Hampshire, Maryland, Delaware, New Jersey, Connecticut and Rhode Island) offer prevention case management statewide, and programs are concentrated where CBOs are located in San Francisco, Los Angeles, and Denver. Given the high rates of AIDS cases reported in the Gulf States and states along the southeastern seaboard with substantial African Americans populations, coverage is very poor.

Health Communications and Public Information

Health communications and public information interventions (Figure 3f) have the broadest geographic coverage. Their distribution for African Americans is better than that of group-level or individual-level interventions. Because of the nature and far reach of health communications, CBOs (depicted by dots) can reach many more people and cover an entire state. Thus, we can see the far-reaching effects of these interventions in cities such as Detroit and New York where large numbers of African Americans live and in entire states such as the southern state of Mississippi. Illinois, Michigan and eastern Texas offer widespread health communications to African Americans. Interestingly, states such as North Dakota, Wyoming, and Nebraska have fewer CBOs and small populations of African Americans. Their choice of interventions is health communications and public information to cover all populations, including African Americans. Most notably, states with substantial black populations (Florida, Georgia, and North Carolina) are lacking in geographic coverage.

Counseling, Testing, Referral and Partner Notification

Figure 3g shows the distribution of HIV prevention programs that provide counseling, testing, referral, and partner notification (CTRPN) to African Americans. This coverage is similar to that of health communications and public information, except for the lack of coverage in Mississippi, Michigan and Wisconsin. Although there is coverage in eastern Texas, the lack of coverage is obvious in the southeastern states and along the eastern seaboard, where there are high rates of HIV and concentrated African American populations.

Alaska, Hawaii, and Washington, D.C.

Table 2 lists the geographic coverage of each intervention type for Alaska, Hawaii and Washington, D.C. The entire District of Columbia was covered by all intervention types. In Alaska, interventions were limited to the Anchorage area and services were not provided for street and community outreach or community-level interventions. In Hawaii, all six CDC-funded CBOs responded to the survey and interventions for most types were provided on the islands of Kauai, Oahu and/or Hawaii. No CBOs provided prevention case management interventions.

Table 2. Geographic coverage of interventions in Alaska, Hawaii and Washington, D.C.

Intervention Type	Alaska	Hawaii	Washington, D.C.
Individual-level	Anchorage	Kauai	Entire district
Group-level	Anchorage	Kauai	Entire district
Street and Community Outreach	-None-	Kauai, Hilo	Entire district
Prevention Case Management	Anchorage	-None-	Entire district
Community-level	None	Kauai	Entire district
Health Communications	Anchorage	Kauai	Entire district
CTRPN	Anchorage	Oahu, Hilo	Entire district

Local-Level Analysis: Alabama Case Study

The HIV/AIDS epidemic is changing to become increasingly rural, female, black and heterosexual (Ricketts, 1999). Seven of the states with the ten highest AIDS case rates in the nation are located in the South (CDC, 2001c). By region, African Americans accounted for the majority of diagnoses in the South and Northeast from 2001-2004 (CDC, 2006). To compound this situation, eight of the top ten states listed as having the highest percentage of population below the Federal Poverty Level are located in the South and nine of the top ten states with the lowest percentage of high school graduates are in the South (Bureau of Labor Statistics, 2000). For this reason we chose a southern state to conduct a local level analysis, which provides detail that can be used for county- or town-level planning services. Further, local level analysis helps us to identify disparities that affect accessibility to these services in terms of geographic location and spatial distribution (Fulcher & Kaukinen 2005; Krieger et al., 2003; Mays, Cochran, & Sullivan, 2000). Alabama has CBOs funded directly by CDC and indirectly by the state health department. It also had a high response rate to our survey: 11 out of 13 CBOs responded.

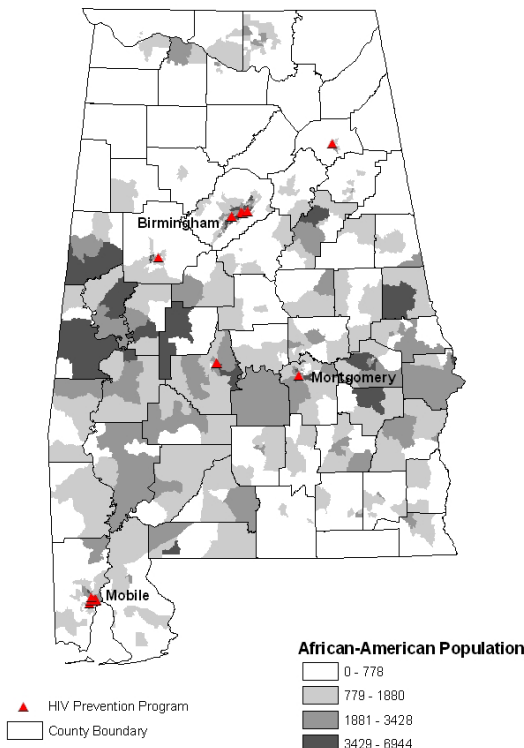
The Alabama Department of Public Health provides reports on cumulative HIV/AIDS cases from 1982 through present. Although African Americans make up only 26% of Alabama's population, they represent a disproportionate 63% of the cumulative HIV/AIDS cases. Black males account for 43.9% of all HIV/AIDS reported; black females account for 19.1% (Alabama Department of Public Health, 2006a). New AIDS cases for African Americans

follow similar trends, with a 2004 AIDS case rate of 34.5 per 100,000, compared to 4.8 for whites and 9.6 for Latinos/Hispanics (CDC, 2005).

Alabama has several types of AIDS service organizations. Some are funded by the Human Resources Administration with a focus on care and treatment, and others are funded by CDC with a focus on prevention and surveillance programs. Our focus is on the community-based organizations funded by the CDC for HIV prevention programs. Since many African Americans are hesitant to access care through the public health system because of fear and distrust, (NASTAD, 2001), CBOs play a very important role to enhance cultural competence and provide accessibility through their network of providers (California State Office of AIDS, 1999)

Alabama’s 11 responding CBOs had a total of 27 CDC-funded HIV prevention programs. Figure 4 shows the distribution of the African American population by census tract, overlaid with county boundaries. Red triangles represent CBOs that provide HIV prevention services.

Figure 4. African American population, 2000: Alabama census tracts.



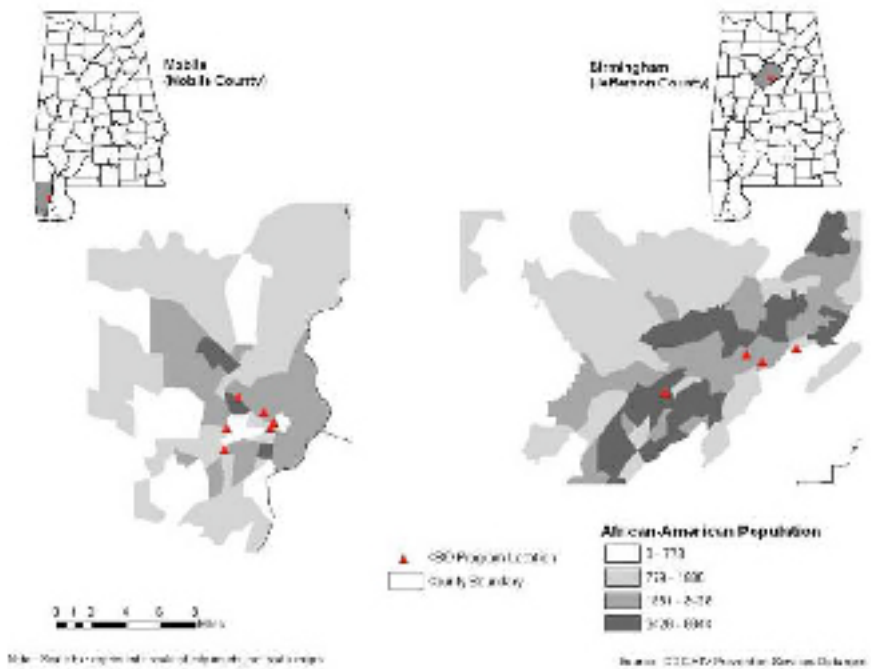
CBOs are located in the major cities. Table 3 shows the number of CBOs and HIV prevention programs, by city. As indicated in the Figure 3 maps, the 11 responding CBOs offer substantial coverage for several of the interventions. Not surprisingly, prevention case management services are located only in Mobile and Birmingham.

Table 3. Alabama CBOs and HIV prevention programs, by city.

City	CBOs	Prevention Programs
Birmingham	4	8
Gadsden	1	1
Mobile	3	11
Montgomery	1	1
Selma	1	5
Tuscaloosa	1	1

We examined Mobile and Birmingham, which, in 2000, had AIDS case rates of 18.3 and 12.5 (U.S. rate 14.6), respectively (CDC 2001d). Larger-scale maps for these cities are shown in Figure 5. Some programs operate out of the same location, so the number of triangles on the map may not correspond with the program numbers in Table 3. In Mobile, one CBO program is located in a census tract with a high African American population (3,429-6,944). All other programs are located in areas close to moderately- or highly-concentrated African American populations. The downtown core for both cities provides the highest degree of accessibility for prevention services for all persons. There are no CBOs in northern Mobile or the northern part of Mobile County, where African Americans concentrations exist; nevertheless, the prevention services offered are within a 20-mile radius. In Birmingham, three programs (represented by a single triangle) are located in an area where African Americans are highly concentrated (3,429-6,944 per census tract) and the others are located in areas where they are moderately concentrated (1,881-3,428 per census tract). Overall, Mobile and Birmingham provide substantial coverage for those persons at high risk for HIV/AIDS who need to be aware of prevention messages and the services that are offered.

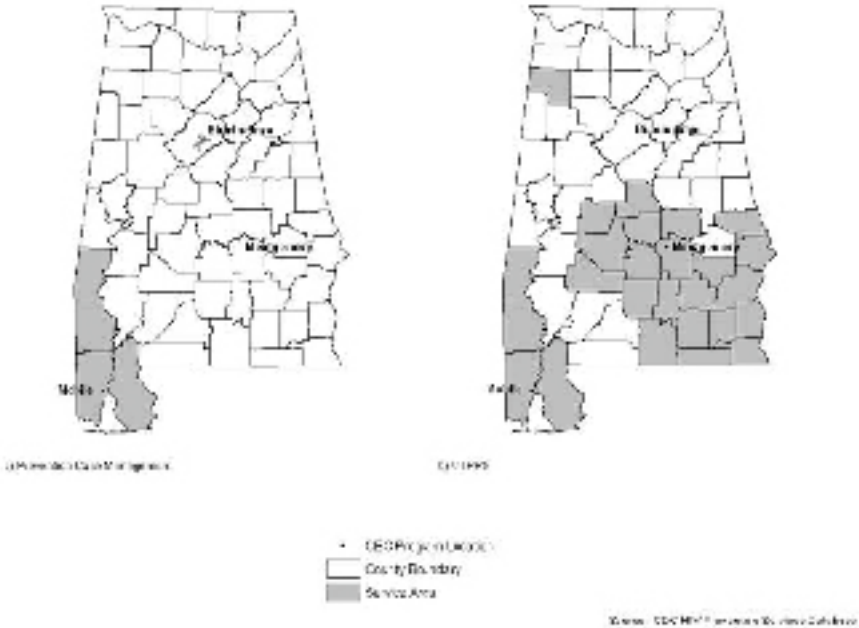
Figure 5. African American population by census tract and CBO locations in Mobile and Birmingham, Alabama.



When we examine the distribution of services statewide for those who are HIV-positive or those with AIDS, we conclude that there is a great disparity in the availability and accessibility of these services for African Americans. Geographic service areas for prevention case management are altogether very sparse (Figure 6a). Four counties in the southwest are all covered by one CBO in Mobile; one CBO in Birmingham offers limited coverage.

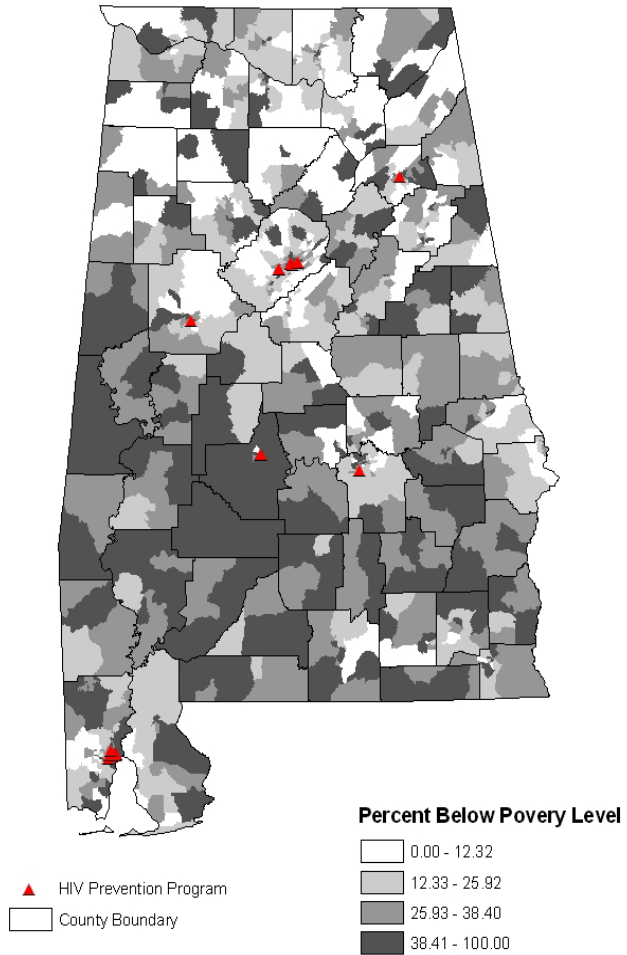
For counseling, testing, referral and partner notification services (CTRPN), one CBO in Montgomery covers 21 counties in the central and southeastern portions of the state. One CBO in Mobile covers four counties in the southwest (Figure 6b). The other 41 counties are not covered for these interventions, which are urgently needed by those who are infected.

Figure 6. Prevention case management and CTRPN services for African Americans in Alabama.



To further understand this disparity, we examined HIV/AIDS prevention services by county and census tract for African Americans in poverty (US Census, 2000). Figure 7 shows that pockets of high African American poverty exist throughout the state, with a large concentration in what is known as the “Black Belt,” i.e. rural agricultural areas that include high unemployment and low levels of education (Institute for Rural Health Research, 2002). The “Black Belt” is comprised of a band of counties south of Birmingham, running northwest to southeast between the Appalachian foothills and the coastal plain. The list of counties traditionally includes Barbour, Bullock, Choctaw, Crenshaw, Dallas, Greene, Hale, Lowndes, Macon, Marengo, Montgomery, Perry, Pickens, Pike, Russell, Sumter, and Wilcox. With the exception of Mobile and Birmingham, the cumulative HIV/AIDS rates are highest in these counties, ranging from 142 per 100,000 in Marengo to 519 per 100,000 in Macon, as shown in Figure 8 (Alabama Department of Public Health, 2006b). Montgomery’s rate is 759 per 100,000, but it is an urban county. Because these rates are cumulative and not annual, they are much higher than state and MSA rates listed in CDC surveillance reports.

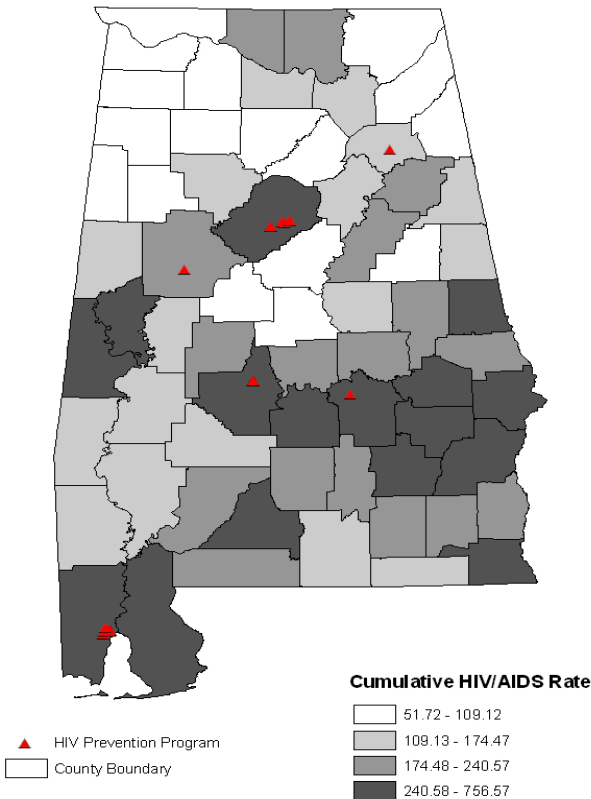
Figure 7. Percent of African Americans in poverty, 2000: Alabama census tracts.



Source: U.S. Census, 2000

The counties in this region include such small rural towns as Eutaw, Livingston, Linden and Butler that have no CDC-funded CBOs and lack service area coverage for prevention case management and CTRPN interventions. Examples of sparse coverage include 1) the only CDC-funded CBO in Tuscaloosa County, which provides services for Pickens, Sumpter, and Green counties, counties with high concentrations of African Americans below the poverty level; and 2) the CDC-funded CBO located in Selma, surrounded by counties (Wilcox, Hale, Perry, Lowndes) heavily concentrated with African Americans below the poverty level. The Selma CBO provides broad coverage for health communications and limited individual- and group-level interventions. Prevention case management and CTRPN interventions are not covered.

Figure 8. Cumulative HIV/AIDS rates, Alabama Counties.



Source: Alabama Department of Public Health

Clearly, all counties in Alabama do not have equal access to HIV-related services. Jefferson County, where Birmingham is located has pockets of African Americans below the poverty level. Most of these are close to the downtown area, but a couple of larger tracts are north of the city. Most of the African Americans in Birmingham are above the poverty level and have access to a myriad of AIDS services provided by the four CBOs in our study. While health communications and public information are well provided throughout Alabama to all populations including African Americans, those living below the poverty level, outside of urban areas, have limited access to individual- and group-level interventions, and sparse to no coverage for prevention case management and CTRPN. The good news is that twelve of the 13 funded CBOs are in key metropolitan areas with the highest rates of HIV/AIDS and are therefore in the position to offer much-needed services. However, a major challenge is the limited coverage for African American MSMs and MSM IDUs, who represent the highest rates of HIV/AIDS in the state (CDC, 2004). This has serious implications for early identification of HIV status, unknown spread to partners, and access to services for those who are HIV-positive and in the later stages of disease. Thus, the relationship between these service areas and the census tracts for African Americans below the poverty level denotes low accessibility.

Although we have examined the location of CDC-funded HIV prevention services in the context of the African American population, we must emphasize that state and local health departments are the main providers of public health services, including prevention case management and CTRPN. Therefore, caution should be taken in making general assumptions about the total universe of available services in Alabama and throughout the nation. Like Alabama, other states offer myriad services through various hospitals, satellite clinics and some private non-profit and for-profit health centers. We analyzed CBOs as they are a recognized auxiliary organization for complementing health department work in developing trust, gaining access and educating individuals about HIV prevention services. As spatial analysis is further explored, researchers should therefore consider all accessible services that have an impact on health for those at high risk for HIV infection and those who are HIV-positive and in need of various healthcare services (e.g. Fulcher & Kaukinen 2005).

While our study provided a cursory overview of African Americans in poverty, based on Alabama census tracts, we did not account for detailed area-based socioeconomic measures (Kreiger et al., 2003) nor other multiple data sources (Whitmore et al., 2005) since our focus was on coverage of CDC-funded prevention programs. However, as many of the Public Health Disparities Geocoding Project studies have shown, the measure

of “percentage of persons below poverty” appears to be as sensitive to socioeconomic inequalities in health as more complex measures of economic deprivation (Krieger et al., 2002; Krieger et al., 2003). Medical geographers have used a number of indices to measure inequalities in the geographic distribution of health care resources (Brown, 1994; Joseph & Hall, 1985; Krieger, Chen, Waterman, Rehkopf & Subramanian, 2003; Shannon & Cutcheon, 1994). Further, although some researchers have conceptualized the location and accessibility of HIV-related services through the container approach, which examines the total number of services available to a given population within their own neighborhood (Queralt & Witte, 1998), we examined only the CDC-funded HIV prevention services by using geopolitical boundaries. Therefore, maps must be interpreted with caution. They display information about CBOs that responded to the survey and the geographic coverage for a particular prevention program. The maps provide no indication of the level of need.

Conclusions

Of the 3,028 HIV prevention programs offered by CDC-funded CBOs during fiscal year 2000, 70% provided HIV prevention services to African Americans. Although the service area patterns for some interventions are consistent with spatial patterns of African American population distributions, and rates of AIDS, others are not. States with low coverage for African Americans include Georgia and Florida, where this population is concentrated in major metropolitan areas, and Alabama where African Americans populate the “Black Belt,” a more rural agricultural area. In North Dakota, Minnesota, and Delaware, the statewide coverage is reported by a single program. In Delaware, it is an HIV/AIDS hotline; in Minnesota, it is a public information/media campaign; and in North Dakota, it is a confidential counseling and testing program.

Other states reported that all racial and ethnic minority populations, including African Americans, were being served by interventions such as health communications. The impact of these interventions needs to be further examined within the context of the specific needs of high-risk populations. The use of supplementary and qualitative data from other CDC data collection efforts is important to further determine the meaning and effectiveness of statewide coverage. While many states have a dispersed distribution of CBOs, indicating that CBOs provide services out of many cities and towns across the state, in some states, the point pattern is clustered, with services provided out of larger, more central locations. In several states, statewide or broad area coverage was consistent with the low distribution of African Americans for such interventions as health communications and public information.

In this study, we have attempted to show general patterns of responses to univariate and bivariate queries. However, the examples cited all point to the importance of gleaning additional information from the data and using the dynamic HIV Prevention Services Database to fill in some of the gaps. It is important to recognize the limitations in interpreting data generated through GIS. Using aggregate data (e.g., AIDS rates, HIV cases) for a state masks local variations in service provision and need. For this reason we provided more localized maps describing service areas for African Americans in Alabama. Research in other geographic areas would provide more insight into health disparities. For example, Florida's services were focused in Miami and Georgia's poor HIV prevention services coverage was provided by a few CBOs located in the Atlanta metropolitan area. Given that AIDS rates in Florida and Georgia are higher than the U.S. rate of 14.9 (Florida has AIDS rates more than twice that of the national average) (CDC, 2004), CDC should consider wider geographic coverage for its CBO HIV prevention programs. Therefore, it is important to gather more information about the types of CBOs, their capacity, and availability of funds to serve those most in need.

In conclusion, GIS techniques are a valuable tool for collecting information about the geographical distribution of HIV prevention services. Specifically, GIS can be used to guide the placement of effective programs for high-risk and infected populations. It can also help CDC to build a more effective infrastructure of CBOs serving these populations to provide accessible, quality, and culturally appropriate HIV prevention programs.

References

- Alabama Department of Public Health, HIV/AIDS Surveillance Branch. (2006a). Brief facts on African-Americans (AF-AMs) and HIV/AIDS. Web site: <http://www.adph.org/AIDS/>.
- Alabama Department of Public Health, HIV/AIDS Surveillance Branch. (2006b). HIV/AIDS cases, Alabama. Web site: <http://www.adph.org/AIDS/>.
- Brown, M.C. (1994). Using Gini-style indices to evaluate the spatial patterns of health practitioners: Theoretical considerations and an application based on Alberta data. *Social Science and Medicine*, 38(9), 1243-1256.
- Bureau of Labor Statistics (BLS). (2000). U.S. Department of Labor. Web site: www.bls.gov.
- California State Office of AIDS. (1999). California collaborations in HIV prevention research: Dissemination project. Web site: uarp.ucop.edu/ca_collaborations/modules/Documents/NewGuidance.pdf.

- Centers for Disease Control and Prevention (CDC). (1999). Program Announcement 99095: Capacity building technical assistance to community-based organizations serving African American populations heavily infected by HIV. Replaced with Program Announcement 04064 in 2005. Web site: http://www.cdc.gov/hiv/topics/prev_prog/AHP/resources/other/PA-04064.htm.
- Centers for Disease Control and Prevention (CDC). (2001a). Evaluating CDC-funded health department HIV prevention programs, volume 1: Guidance. Atlanta: US Department of Health and Human Services, Centers for Disease Control and Prevention.
- Centers for Disease Control and Prevention (CDC). (2001b). Evaluating CDC-funded health department HIV prevention programs, volume 2: Supplemental handbook. Atlanta: US Department of Health and Human Services, Centers for Disease Control and Prevention.
- Centers for Disease Control and Prevention. (2001c) HIV prevalence trends in selected populations in the United States: Results from national serosurveillance, 1993–1997. Atlanta: US Department of Health and Human Services, Centers for Disease Control and Prevention.
- Centers for Disease Control and Prevention (CDC). (2001d). HIV/AIDS surveillance report, 2001. Vol.13, No. 2. Atlanta: US Department of Health and Human Services, Centers for Disease Control and Prevention.
- Centers for Disease Control and Prevention (CDC). (2003a). HIV/AIDS surveillance report, 2003. Vol.15. Atlanta: US Department of Health and Human Services, Centers for Disease Control and Prevention.
- Centers for Disease Control and Prevention (CDC). (2003b). Advancing HIV prevention: new strategies for a changing epidemic. *MMWR*, 52,329-32.
- Centers for Disease Control and Prevention (CDC). (2004). HIV/AIDS surveillance report, 2004. Vol.16. Atlanta: US Department of Health and Human Services, Centers for Disease Control and Prevention.
- Centers for Disease Control and Prevention (CDC). (2005). Adult and adolescent annual AIDS case rate per 100,000 population by race/ethnicity, reported in 2004. Special data request, Division of HIV/AIDS Prevention-Surveillance and Epidemiology, Web site: www.statehealthfacts.org.
- Centers for Disease Control and Prevention (CDC). (2006). Racial/ethnic disparities in diagnoses of HIV/AIDS – 33 states, 2001-2004. *MMWR*, 55(05),121-125.
- Fulcher, C., & Kaukinen, C. (2005). Mapping and visualizing the location of HIV service providers: An exploratory spatial analysis of Toronto neighborhoods. *AIDS Care*, 17(3), 386–396.
- Hanchette, C.L., Gibbs, D.A., Gilliam, A., Fogarty, K.J., & Bruhn, M. (2005). A national, geographic database of CDC-funded HIV prevention services: development challenges and potential applications. *International Journal of Health Geographics*, 4(28). Web site: <http://www.ij-healthgeographics.com/content/4/1/28>.

- Hendryx, M., Ahern, M., Lovrich, N., & McCurdy, A. (2002). Access to health care and community social capital. *Health Services Research*, 37(1), 87–103.
- Hirth, R.A., Tedeschi, P.J., & Wheeler, J.R. (2001). Extent and sources of geographic variation in Medicare and end-stage renal disease expenditures. *American Journal of Kidney Diseases*, 38(4), 824–831.
- Hyndman, J.C.G., & Holman, C.D.J. (2001). Accessibility and spatial distribution of general practice services in an Australian city by level of social disadvantage. *Social Science and Medicine*, 53(12), 1599–1609.
- Institute for Rural Health Research (2001). *Black Belt fact book*, University of Alabama, Health Sciences. Tuscaloosa, Alabama. Web site: <http://irhr.us.edu/blackbelt.notes.html>.
- Joseph, A.E., & Hall, G.B. (1985). The locational concentration of group homes in Toronto. *Professional Geographer*, 37(2), 143–154.
- Kistemann T., Dangendorf, F., & Schweikart, J. (2002). New perspectives on the use of geographical information systems (GIS) in environmental health sciences. *International Journal of Hygiene & Environmental Health*, 205(3), 169–181.
- Krieger, N., Chen, J.T., Waterman, P.D., Soobader, M., Subramanian, S.V. & Carson, R. (2002). Geocoding and monitoring of US socioeconomic inequalities in mortality and cancer incidence: Does the choice of area-based measure and geographic level matter? *American Journal of Epidemiology*, 156, 471-82.
- Krieger, N., Waterman, P., Chen, J., Soobader, M., & Subramanian, S. (2003). Monitoring socioeconomic inequalities in sexually transmitted infections, tuberculosis, and violence: Geocoding and choice of area-based socioeconomic measures – The Public Health Disparities Geocoding Project (US). *Public Health Reports*, 118, 240–261.
- Krieger, N., Chen, J.T., Waterman, P.D., Rehkopf, D., & Subramanian, S.V. (2003). Race/ethnicity, gender and monitoring socioeconomic gradients in health: A comparison of area-based socioeconomic measures – the Public Health Disparities Geocoding Project. *American Journal of Public Health* 93(10), 1655-1671.
- Mays, V., Cochran, S., & Sullivan, J. (2000). Health care for African Americans and Hispanic women: Report on perceived health status, access to care, and utilization patterns. In C. Hogue, M. Hargraves, & K. Scott Collins. (Eds), *Minority health in America: Findings and policy implications from the commonwealth fund minority health survey* (pp. 97-123). Baltimore: The Johns Hopkins University Press.
- McLafferty, S.L. (2003). GIS and health care. *Annual Review of Public Health*, 24,25-42.
- National Alliance of State and Territorial AIDS Directors (NASTAD) (2001). *HIV/AIDS: African-American perspectives and recommendations for state and local AIDS directors and health departments*. Web site: <http://www.nastad.org/> .
- Parker, E.B., & Campbell, J.L. (1998). Measuring access to primary medical care: Some examples of the use of geographical information systems. *Health & Place*, 4(2), 183–193.

- Phillips, R.L., Kinman, E.L., Schnitzer, P.G., Lindbloom, E.J., & Ewigman, B. (2000). Using geographic information systems to understand health care access. *Archives of Family Medicine*, 9(10), 971–978.
- Queralt, M., & Witte, A. (1998). A map for you? Geographic information systems in the social sciences. *Social Work*, 43(5), 455–469.
- Ricketts, T. (1999). *Rural health in the United States*. New York: Oxford University Press.
- Shannon, G.W., & Cutcheon, M.P. (1994). General practitioner distribution and population dynamics: Munich, 1950-1990. *Social Science and Medicine*, 39(1), 23–38.
- Simpson, K., DesHarnais, S., Jacobs, A., and Menapace, A.. (1994). Methods for defining medical service areas. In T.C. Ricketts, L.A. Savitz, W.M. Gesler, & D.N. Osborne (Eds.), *Geographic methods for health services research: A focus on the rural-urban continuum* (pp. 207–232). Lanham, MD: University Press of America.
- US Census Bureau. (2000). Washington, DC: Government Printing Office (GPO), United States of America.
- US Census Bureau. (2000). Population profile of the United States: Web site: <http://www.census.gov>.
- US Department of Health and Human Services (DHHS). (2000). *Healthy People 2010: Understanding and improving health*. 2nd ed. Washington, DC: US Government Printing Office.
- Whitmore, S.K., Zaidi, I.F., & Dean, H. (2005). The integrated epidemiologic profile: Using multiple data sources in developing profiles to inform HIV prevention and care planning. *AIDS Education and Prevention*, 17, Supplement B, 3–16.

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