Original Article

Effectiveness of a Federal Healthy Start Program on HIV/AIDS Risk Reduction among Women in Hillsborough County, Florida

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Objectives: To examine the impact of the Central Hillsborough Healthy Start Project (CHHS) on human immunodeficiency virus (HIV)/acquired immunodeficiency syndrome (AIDS) diagnosis rates in women in Hillsborough County, Florida.

Methods: Project records were linked to hospital discharge data and vital statistics (Florida, 1998–2007; N = 1,696,221). The χ^2 test was used to compare rates for HIV/AIDS and pregnancy-related complications for mothers within the CHHS service area with mothers in Hillsborough County and the rest of Florida.

Results: During a 10-year period, HIV/AIDS diagnosis rates among women in the CHHS service area declined by 56.3% ($P = 0.01$). The observed decline was most evident among black women. HIV/AIDS diagnosis rates in the rest of Hillsborough County and Florida remained unchanged ($P = 0.48$).

Conclusions: Lessons learned from the CHHS Project can be used to develop effective and comprehensive models for addressing the HIV epidemic.

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Since the beginning of the human immunodeficiency virus (HIV) epidemic in the 1980s, many Americans have contracted the virus. It is estimated that nearly 1 in 300 Americans is infected with HIV, with racial/ethnic minorities being disproportionately affected.[1] Among individuals diagnosed as having acquired immunodeficiency syndrome (AIDS), nearly 90% of those between the ages of 13 and 15 years old were exposed perinatally, and perinatal exposure accounted for approximately half of all AIDS diagnoses among individuals aged 16 to 19 years.[1] Reducing HIV infection in mothers is therefore an important component of HIV prevention programs.

In 2007, Florida was among the top three states for adult HIV prevalence and adult AIDS prevalence (256.1/100,000 and 311.5/100,000, respectively).[2] At the end of 2007, a total of 39,686 Florida residents were living with HIV, and 48,059 were classified as having AIDS.[2] That same year, an estimated 2057 (21.5/100,000) new HIV infections were diagnosed among women in the state.[3] In Hillsborough County, 129 women (21.1/100,000) were newly diagnosed as having HIV in 2007.[3] It is estimated that girls and women of childbearing age (15 to 44 years of age) account for 59% of cases.[4] A total of 672 babies were born to HIV-positive women in Florida in 2007, 17 (2.5%) of whom were infected with HIV.[5]

Key Points

- Human immunodeficiency virus/acquired immunodeficiency syndrome diagnosis rates among women living in areas served by Florida's Central Hillsborough Healthy Start Project declined by 56% between 1998 and 2007.
- Lessons learned from Florida's Central Hillsborough Healthy Start Project can be used to develop effective and comprehensive models for addressing the human immunodeficiency virus/acquired immunodeficiency syndrome epidemic in the southeastern United States.

The Central Hillsborough Healthy Start Project (CHHS) is a federally funded, community-based intervention program that works toward the reduction of racial/ethnic disparities in maternal and infant health within socioeconomically challenged neighborhoods in Tampa, Florida.[6] The CHHS project has been shown to reduce the risk for adverse outcomes, such as low birth weight and preterm birth.[6] The evidence in support of a protective effect of Healthy Start services on related secondary reproductive health outcomes, such as HIV/AIDS, is limited. Such an effect, however, would not be entirely unexpected because Healthy Start programs such as CHHS strive to improve access to and utilization of health care for women of reproductive age, which may help reduce risky health behaviors associated with HIV infection.[7,8]

The purpose of our study was to assess the impact of the CHHS on HIV/AIDS diagnosis rates among mothers. We hypothesized that overall diagnosis rates of HIV/AIDS between 1998 and 2007 among women living in areas served by the CHHS program would be lower than HIV/AIDS diagnosis rates among women living in areas not served by the program.

Methods

The data used were from the CHHS, vital statistics records came from the Florida Department of Health for the years 1998 through 2007, and records were from the Florida Agency for Health Care Administration Hospital Inpatient Discharge (HID) dataset. These datasets were linked during the same period using unique identifiers. Within the HID dataset, diagnoses of HIV/AIDS (the outcome of interest) were recorded using standard codes from the *International Classification of Diseases, Ninth Revision, Clinical Modification*. The study population consisted of women who delivered their babies within the CHHS service area (n = 14,632), Hillsborough County (n = 113,875), and the rest of Florida (n = 1,567,714) during the study period. The resulting study population totaled 1,696,221 across the state of Florida.

The CHHS approaches the problem of HIV/AIDS prevention in the community through two interfaces. Home visitation and the Preconception/Interconception Care Group are the two means through which the CHHS provides services for mothers to prevent HIV/AIDS. The services offered during visitation include testing to determine whether the mother needs HIV/AIDS counseling; reminders regarding medical appointments; and referral to the specific care group for preconception and interconception care. Once referred to the Preconception/Interconception Care Group, mothers gain access to educational services with a curriculum focused on four specific areas of preconception/interconception: health education, family and community involvement, counseling and mental health services, and general health services. From partner agencies, women also receive educational services on the importance of contraceptive usage and prevention of sexually transmitted infections (STIs). The interconception coordinator supervises and manages CHHS interconception care events. CHHS staff, subcontractors, and local providers provide interconception services. Partner agencies provide HIV testing and counseling, health education, and referrals, if needed. The interconception care element also promotes access to contraception for females of reproductive age; advocates the use of medically accurate information; and addresses abstinence, when appropriate, in an ethical, nonjudgmental, and professional manner.

In June 2009, CHHS implemented the National Healthy Start Interconception Care Learning Collaborative. This component provides health education on various topics from a life course perspective by allowing the interconception consumers to receive an interconception care needs assessment, which identifies individual-level health needs and concerns, both perceived and actual. The proportion of women who received services from the CHHS Federal Healthy Start fluctuated from year to year; however, and as previously reported, the average percentage of women reached/enrolled within the service area was approximately 47%.[6] Because women enrolled in the program did not have the same baseline risk score, it was difficult to define an average completion rate across individual baseline score variances.

The intensity of services provided depends on the risk stratification/categorization based on the Florida Prenatal Screening Score. Florida's universal screening of pregnant women and infants includes a series of questions that focus on medical, environmental, and psychosocial factors that identify a patient as at risk. The score is determined by summing the contributing items, each worth one point except for race, which contributes two points. The following 15 variables comprise the components of the screening score: black race, maternal age younger than 18 years or older than 39 years, unmarried, less than high school education, low maternal weight (<110 lb), problems keeping appointments, moving ≥3 times in the past year, feeling unsafe, going to bed hungry, tobacco use in the past 2 months, use of drug or alcohol in the past 2 months, unwanted pregnancy, current maternal illness, seeking prenatal care in the second trimester, and history of poor outcomes or no previous pregnancy experience. Table 1 provides a detailed assessment for risk stratification using this score. Although the score assists in the allocation of resources to mothers and their infants (mothers with higher scores receiving greater attention), the intensity of receipt of services also may be influenced subsequently during the pre- or postnatal period based on attendant needs that may arise.

The HIV/AIDS diagnosis rate was the outcome variable in this analysis. Information on HIV/AIDS status of women was extracted from the HID dataset. Maternal sociodemographic variables were abstracted from vital statistics data. These variables included age, race/ethnicity, marital status, educational level, parity, smoking status, and adequacy of prenatal care. Maternal age was categorized into two groups: younger than

Table 1. Screening items for pregnant women accessing services through the CHHS

Variables	Categories	Points
Questions answered by mothers		
Your age, y		
	<18	1
	>39	1
Your race		
	Black	2
	White	0
	Other	0
Are you married?		
	Yes	0
	No	1
You graduated from high school or received a GED		
	Yes	0
	No	1
Your weight before pregnancy, lb	<110	1
Do you have any problems which prevent you from keeping your healthcare or social services appointments?	Yes	1
Have you moved more than 3 times in the last 12 months?	Yes	1
Do you feel unsafe where you live?	Yes	1
Do you or any member of your household go to bed hungry?	Yes	1
In the last 2 months, have you used any form of tobacco?	Yes	1
In the last 2 months, have you used drugs or alcohol (including beer, wine, mixed drinks)?	Yes	1
If you could change the timing of this pregnancy, would you want it		
	Earlier	0
	Later	0
	Not at all	1
	No change	0
Questions answered by healthcare provider		
Did patient's last pregnancy result in a miscarriage, stillbirth, a baby <5.5 lb, a baby born more than 3 weeks early, or a baby that stayed in the hospital after the patient went home?	Yes	1
Does patient have any illness that requires continuing medical care? Specify illness?	Yes	1
Trimester of entry at first prenatal visit?	Second	1

Points are totaled for each patient. A total score of ≥4 is considered a positive screening. A total score of ≤3 is considered a negative screening. CHHS, Central Hillsborough Healthy Start Project; GED, General Educational Development test.

35 years and 35 years and older. We categorized race/ethnicity into four categories: white, African American/black, Hispanic/Latino, and other. Marital status was dichotomized into married or unmarried, with all individuals divorced, widowed, or of unknown marital status classified as unmarried. Educational level was classified as either <12 years of education or ≥12 years of education. Parity was dichotomized as either nulliparous or parous. Maternal prenatal smoking was dichotomized as a yes or no response. We assessed the adequacy of prenatal care using the Revised Graduated Index algorithm, which defines the adequacy of care based on the trimester when prenatal care began, the number of prenatal clinic visits, and the gestational age of the infant at birth.[9] This variable was dichotomized as either adequate or inadequate, with inadequate prenatal care utilization referring to women who either had missing prenatal care information, received prenatal care but the level was considered suboptimal (ie, fewer prenatal care visits as compared with the length of pregnancy), or received no prenatal care at all.

Statistical Analysis

Baseline characteristics among women in the study were compared by exposure status (ie, women within the CHHS service area [exposed] vs those within Hillsborough and the rest of Florida [unexposed]) using the χ^2 test. A crude frequency comparison for the presence of common obstetric and medical complications also was performed. These variables include anemia; insulin-dependent diabetes mellitus; gestational diabetes; pregnancy-induced hypertension; hypertension complicating pregnancy, childbirth, and the puerperium; preexisting hypertension; preeclampsia; eclampsia; placental abruption; and placenta previa. Alcohol and drug use during pregnancy also were assessed. Using the χ^2, pregnancy-related complications for mothers within the CHHS service area were compared with Hillsborough and the rest of Florida. Cross-tabulations were performed to calculate HIV/AIDS diagnosis rates for the study areas and the different race and age categories within the CHHS service area. Trends in HIV/AIDS diagnosis rates within the CHHS service area, Hillsborough County, and the rest of Florida were assessed. Furthermore, we assessed trends in HIV/AIDS diagnosis rates within the CHHS service area based on maternal race and age. All of the tests were two-tailed, with a type 1 error rate fixed at 5%. SAS version 9.2 (SAS Institute, Cary, NC) was used to perform all of the analyses. The institutional review board of the University of South Florida approved the study.

Results

Table 2 shows the frequency comparison of selected sociodemographic characteristics among mothers in the CHHS service area, Hillsborough County, and the rest of Florida. In comparison with mothers within Hillsborough County and the rest of the state, mothers within the CHHS service area were more likely to be younger, African American/black, unmarried, and with at least a high school diploma ($P < 0.01$). In addition, a significantly higher proportion of mothers within the CHHS service area are HIV positive relative to those within Hillsborough County and the rest of Florida ($P < 0.01$). Mothers within

Table 2. Maternal sociodemographic characteristics of the study population (Florida, 1998–2007)

Characteristics	CHHS (n = 14,632) %	Hillsborough (n = 113,875) %	Florida (n = 1,567,714) %	*P* (CHHS vs Hillsborough)	*P* (CHHS vs Florida)
Race				<0.01	<0.01
White	21.25	56.80	53.10		
Black	55.69	15.83	21.57		
Hispanic/Latino	17.01	17.30	18.97		
Other	6.05	10.07	6.37		
Advanced for maternal age, ≥35 y	8.11	14.13	14.50	<0.01	<0.01
Education, ≥12 y	35.50	17.73	17.52	<0.01	<0.01
Not married	68.33	35.91	39.17	<0.01	<0.01
Nulliparous	31.37	33.88	34.39	<0.01	<0.01
Smokers	6.81	7.40	9.16	0.01	<0.01
Adequate prenatal care	64.05	67.66	51.31	<0.01	<0.01
HIV positive	0.71	0.15	0.28	<0.01	<0.01

CHHS, Central Hillsborough Healthy Start Project; HIV, human immunodeficiency virus.

Hillsborough County and the rest of Florida were more likely to be nulliparous and to smoke cigarettes ($P < 0.01$).

The crude frequencies of pregnancy-related complications within the study population are presented in Table 3. Mothers within the CHHS area were more likely to have anemia, hypertension complicating pregnancy, preexisting hypertension, preeclampsia, and eclampsia. Rates for alcohol and drug abuse also were higher among women living in the CHHS area than among their counterparts living in Hillsborough County and other parts of Florida not served by CHHS ($P < 0.01$).

Fig. 1 presents trends in HIV/AIDS diagnosis rates among the study population living in the three study areas. The rate of HIV/AIDS diagnosis among mothers within the CHHS area increased from 0.8% in 1998 to 1.19% in 1999, and thereafter declined almost steadily until 2007, with the exception of a spike in 2005, when the HIV/AIDS diagnosis rate was 0.88%. Overall, there was a decrease in the HIV/AIDS diagnosis rate among mothers within the CHHS area from 0.80% in 1998 to 0.35% in 2007, representing an overall reduction of 56.3% in the rates of diagnosis of HIV/AIDS within the CHHS service area ($P = 0.01$). In Hillsborough County, however, HIV/AIDS diagnosis rates increased from 0.14% to 0.19% during the same period, with a peak HIV diagnosis rate of 0.22% in 2002. Among women living in the rest of Florida, HIV/AIDS rates remained relatively stable during the 10-year period, with only a 4.0% decline occurring between 1998 and 2007 ($P = 0.48$).

Fig. 2 shows trends in HIV/AIDS diagnosis rates by maternal age in the CHHS service area. Among women younger

Table 3. Summary of pregnancy-related complications within the study population (Florida, 1998–2007)

Characteristics	CHHS (n = 14,632)	Hillsborough (n = 113,875)	Florida (n = 1,567,714)	*P* (CHHS vs Hillsborough)	*P* (CHHS vs Florida)
Anemia	13.98	8.50	6.75	<0.01	<0.01
Gestational diabetes	3.57	4.62	3.65	<0.01	0.61
Diabetes mellitus	0.84	0.63	0.70	<0.01	0.04
Pregnancy-induced hypertension	4.33	4.14	2.93	0.29	<0.01
Hypertension complicating pregnancy	10.82	9.05	8.60	<0.01	<0.01
Preexisting hypertension	1.93	1.33	1.33	<0.01	<0.01
Preeclampsia	3.53	2.61	2.97	<0.01	<0.01
Eclampsia	0.14	0.07	0.09	<0.01	0.04
Abruption	0.92	0.71	0.82	<0.01	0.22
Placenta previa	0.38	0.51	0.49	0.05	0.06
Alcohol abuse	0.23	0.11	0.05	<0.01	<0.01
Drug abuse	1.91	0.72	0.59	<0.01	<0.01

CHHS, Central Hillsborough Healthy Start Project.

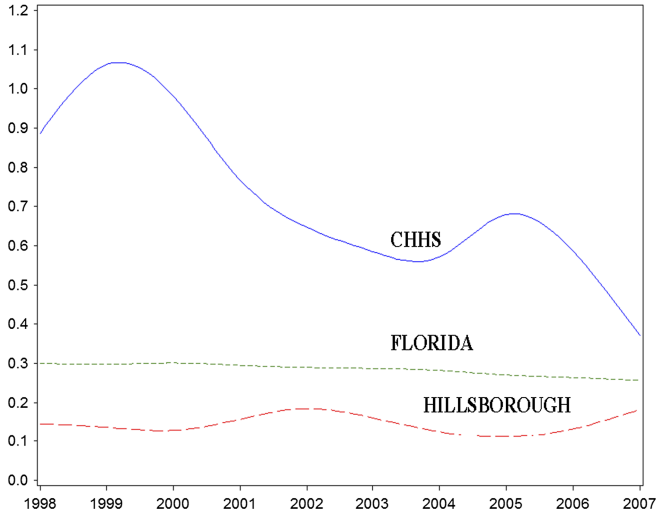

Fig. 1. Temporal trends of human immunodeficiency virus/acquired mmunodeficiency syndrome rates in the Central Hillsborough Healthy Start Project service area versus the rest of Hillsborough County and Florida, 1998–2007.

than 35 years, HIV diagnosis rates increased from 0.65% in 1998 to a peak of 1.28% in 1999; thereafter, the rates decreased gradually to its lowest level of 0.32% in 2007. Among women 35 years old and older, HIV diagnosis rates also decreased from 2.7% in 1997 to 0.72% in 2007. From 1998 to 2007, the rates of HIV diagnosis decreased by 50.8% and 73.3% among women younger than 35 years and women 35 years old and older, respectively. For some of the years examined, no woman 35 years old or older in the dataset had HIV/AIDS.

Fig. 3 shows the trends in HIV/AIDS diagnosis rates by maternal race within the CHHS service area. Following a spike (2.05%) in HIV diagnosis rates among African Americans/blacks in the CHHS area in 1999, the rates declined almost steadily, reaching a nadir of 0.40% in 2007. This represents a decline of 71.2% from the 1998 baseline rate. Unlike the decreasing trends in HIV/AIDS diagnosis rates observed among African Americans/blacks within the CHHS service area, the rates of HIV/AIDS diagnosis increased slightly among whites, from 0% in 1998 to 0.39% in 2007.

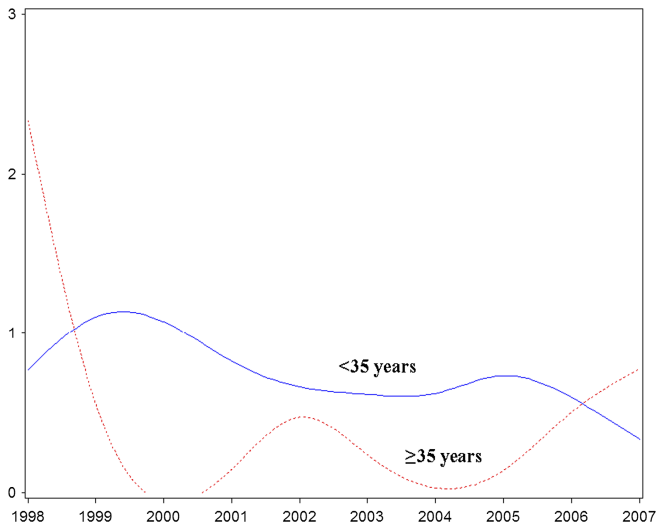

Fig. 2. Trends of human immunodeficiency virus/acquired immunodeficiency syndrome rates within the Central Hillsborough Healthy Start Project service area by maternal age, 1998–2007.

Discussion

We report a 56% reduction in overall diagnosis rates of HIV/AIDS between 1998 and 2007 among women living in an area served by a federally funded, community-based intervention program, the CHHS. This decreasing trend was more marked among African American/black women and older mothers (35 years old and older). To our knowledge, this is the first evidence of a community-based, federal Healthy Start program having a protective effect on secondary reproductive health outcome, such as HIV/AIDS. Our findings have important implications for policy makers, health practitioners, and HIV prevention advocates.

Observed declines in HIV diagnosis rates in the CHHS service area are consistent with national trends, namely stabilizing HIV incidence and decreasing overall AIDS incidence.[10] A factor that may contribute to this trend is the decline in overall transmission. According to the Centers for Disease Control and Prevention, an 89% decline in HIV transmission rates occurred in the United States since the peak level of new infections in the mid-1980s.[11] In 2006, at least 95% of people living with HIV infection in the United States did not transmit the virus to others that year (approximately 5 transmissions/100 individuals living with HIV infection).[11] The decline in transmission is most likely the result of effective prevention efforts and the increased availability of improved HIV testing and treatment services nationally.[12] Our analysis, however, shows a significant downward trend in the CHHS service area in terms of HIV rates among mothers compared with a flat

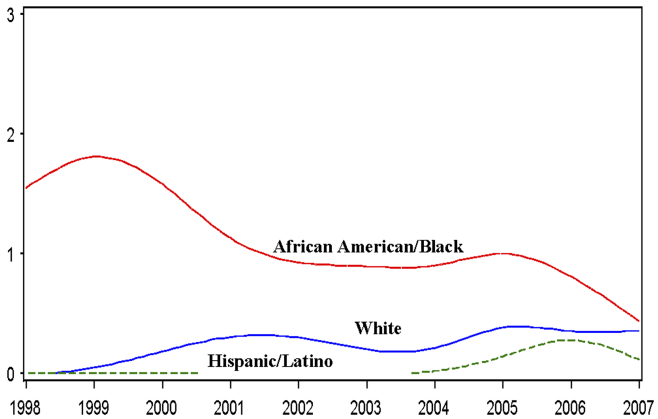

Fig. 3. Trends of human immunodeficiency virus/acquired immunodeficiency syndrome rates within the Central Hillsborough Healthy Start Project service area by maternal race, 1998–2007.

trend in the rest of the county and state. We speculate that enhanced HIV prevention campaigns through the CHHS federal Healthy Start Project may contribute to the significant decline contrary to the virtual nondecline observed among women in the rest of the county and state.

African American/black women are disproportionately affected by the HIV/AIDS epidemic. Despite representing only 13% of the female population of the United States,[13] African American/black women account for approximately two-thirds (64%) of all new HIV infections among US women.[14] African American/black women also represent a disproportionate fraction of women living with HIV and of HIV-related mortality among women in the United States (60% and 64%, respectively).[15,16] Sociodemographic issues that likely contribute to the higher incidence of HIV in African Americans/blacks include higher rates of STIs, poverty, stigma, and drug use.[17–20] In this study, we report a 71% decline in HIV diagnosis rates (from baseline 1998) among African Americans/black women living in the CHHS area. We also note the disappearance of black-white disparity in HIV diagnosis rates by 2007 in the CHHS service area. The CHHS program likely affected HIV diagnosis rates by influencing access to and utilization of healthcare services by African American/black women of reproductive age.[7] The steep decline in diagnosis rates among African Americans/blacks is encouraging and underscores the need to sustain and accelerate targeted prevention efforts in this population.

We were unable to show a similar downward trend in HIV diagnosis rates among white women living in the CHHS area. The HIV diagnosis rate among white women in the CHHS service area was 0% in 1998, 1999, and 2004. The variation in trends between African Americans/blacks and whites may be caused by differences in HIV risk behavior and disparities in HIV knowledge and in HIV testing uptake. In addition, estimates of HIV incidence are sensitive to changes in HIV surveillance, which in turn is influenced by HIV testing patterns.[21–23] It is therefore possible that the increase in the HIV/AIDS diagnosis rate is artificial and results from increased detection associated with more efficient surveillance and testing practices. The contribution of other social determinants of health, such as baseline HIV/STI prevalence, partner availability, enrollment in the correctional system, homophobia, and residential segregation cannot be ruled out.

The population-based design that increases the generalizability of our findings is a strength of our study. We had data for births throughout the state of Florida from 1998 to 2007, resulting in a sufficient sample size to minimize selection bias and enhance the power for the study to detect differences in risk. In our analysis, we controlled for several potential confounders, although we cannot rule out residual confounding caused by unmeasured variables.

In terms of limitations, the well-known weakness of ecologic study designs applies to this study, namely that inference about individuals based on aggregate data for a group is vulnerable to the ecological fallacy.[24,25] As such, declines in HIV diagnosis rates as shown in this study may conceal variations that are not visible at the larger aggregate level. Another limitation is our inability to disaggregate and analyze data by specific at-risk groups, such as men who have sex with men and injection drug users. It is well established that the pattern epidemiology of HIV infection in these groups can vary substantially from that of the general population.[22] Another potential source of bias is our inability to ascertain the impact of migration patterns on HIV diagnosis rates in the communities studied.

Conclusions

Community-based organizations have historically played strategic roles in combating the HIV epidemic.[26] Their close ties to the host community, participatory nature, and deep understanding of local sociocultural and contextual factors make them indispensable in local community disease-prevention activities.[27] Our findings can be used for policy making related to planning and allocation of HIV prevention funds. They also highlight the importance of the CHHS project and the need to continue to strengthen and support its ability to deliver effective and sustainable HIV/AIDS education and prevention programs.

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