HIV Testing Trends: Southeastern Pennsylvania, 2002–2010

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Abstract

There are limited data on HIV testing trends after 2006 when the Centers for Disease Control and Prevention (CDC) introduced opt-out HIV testing with the aims of identifying HIV-infected persons early and linking them to care. We used data from the Southeastern Pennsylvania Household Health Survey between 2002 and 2010 to evaluate HIV testing over time. 50,698 adult (≥ 18 years) survey respondents were included. HIV testing increased after the CDC recommendations: 42.1% of survey respondents received testing at least once in 2002 versus 51.4% in 2010, $p < 0.001$. Testing trends increased among all demographic groups, but existing differences in testing before 2006 persisted after that year as follows: younger patients, racial/ethnic minorities, patients on Medicaid were all more likely to get tested than their counterparts. Blacks and patients seeking care in community health centers had the fastest rise in HIV testing. The probability of HIV testing in Blacks was 0.56 (95% CI 0.54–0.60) in 2002 and increased to 0.73 (0.70–0.76) by 2010. Patients seeking care in community health centers had a probability of HIV testing of 0.57 (0.47–0.66) in 2002, which increased to 0.69 (0.60–0.77) by 2010. In comparison, patients in private clinics had an HIV testing probability of 0.40 (0.36–0.43) in 2002 compared to 0.47 (0.40–0.54) in 2010. HIV testing is increasing, particularly among ethnic minorities and in community health centers. However, testing remains to be improved in that setting and across all clinic types.

Introduction

AT THE END OF 2006, 1.1 MILLION PEOPLE in the United States were living with HIV, with over 200,000 people unaware of their infection.¹ The estimated incidence of HIV has remained stable in recent years, at about 50,000 new HIV infections per year; however, African Americans and men who have sex with men (MSM) remain disproportionately affected by HIV.² In order to promote earlier detection of HIV infection and reduce rates of HIV transmission and complications of late presentation, the Centers for Disease Control and Prevention (CDC) issued new HIV screening recommendations.³ These recommendations called for universal (opt-out) one-time HIV testing in all health-care settings for persons aged 13–64 years. For high risk individuals (injection drug users and their sexual partners, persons who exchange sex for money or drugs, MSM, or heterosexual

persons who themselves or whose sex partners have had more than one sex partner) yearly HIV testing was recommended. Additionally, the need for separate written consent for HIV testing and prevention counseling was eliminated accepting general consent for medical care as sufficient.³

Three years after publication of the new CDC recommendations, a state by state review of all statutes pertaining to HIV testing was done to evaluate the extent of legislative compatibility with the new CDC recommendations.⁴ In this study, states were categorized as consistent, neutral, or inconsistent with the CDC recommendations. Pennsylvania State law was found to be inconsistent with the CDC recommendations.⁴ An amendment to Pennsylvania State law to be aligned with the CDC recommendations was not made until 2012.⁵ In 2007, in an effort to increase awareness and provide structural support for HIV testing in emergency departments and community health centers, the CDC funded

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several health departments across the country to expand universal testing in these venues under the Expanded Testing Initiative.⁶ The Philadelphia Department of Health received this funding. How these policies have affected HIV testing is unknown.

Since the 2006 CDC recommendations, national HIV testing was found to be stable in one study, increasing only from 42% to 43% between 1999–2000 and 2009–2010.⁶ In a similar study, testing was found to have increased from 40% to 45% between 2001 and 2009.⁷ In Washington DC alone, HIV testing rose from 14.9% in 2005 to 18.7% in 2007.⁸ These studies used data sources in which HIV testing was anonymously provided by self-report. Although the authors do not link increased testing to specific interventions, local public health department outreach, campaigns to educate providers and the general population, and allocation of federal public health resources to communities disproportionately impacted by HIV may have contributed to what seems to be a marginal increase in HIV testing.

The benefits of HIV screening are well established.^{9–13} At the individual level, testing identifies infected persons, leading to reduced high risk behaviors,^{9,10} engagement in medical care,^{9,10} improved quality of life,^{11,12} and decreased mortality^{13–15} from the use of antiretroviral therapy (ART). At the population level, virological control decreases the risk of HIV transmission resulting in decreased population viral load and health care related cost.^{16,17} As a result, HIV screening is a cornerstone of the National HIV/AIDS Strategy for the United States, which has established a goal of increasing the percentage of persons living with HIV who are aware of their infection from 79% to 90% by 2015.^{18,19} It is essential therefore to assess progress in HIV testing subsequent to the new CDC recommendations and find ways to continue to improve screening rates, especially among high risk groups. In this study, we evaluate trends in HIV testing before and after the 2006 CDC recommendations within a large metropolitan area to better understand how demographic, socioeconomic, and access to care factors are associated with HIV testing.

Methods

Study sample

We performed repeated cross sectional analyses using data from multiple waves of the Southeastern Pennsylvania (SEPA) Household Health survey, a telephone survey performed by the Public Health Management Corporation (PHMC). Administered every 2 years, it is the largest and most comprehensive health survey done in Pennsylvania²⁰ and focuses on the health status and health care experiences of adults living in 54 service areas. Each of these service areas, which combine clusters of ZIP codes, has approximately 30,000 to 75,000 adult residents, based upon population estimates derived from the U.S. Census. Persons in approximately 10,000 households are randomly selected using computerized random digit dialing (RDD) and interviewed (in English or Spanish) about their health status, personal health behaviors, access to primary care, utilization of health services, and quality of services received. The sample is stratified to ensure sufficient representation within smaller geographic areas, resulting in a representative sample of the region. In 2008 and 2010, a small proportion of the

interviews were done by cellular phone (3% and 10%, respectively). Data were de-identified from individual persons before release; for this reason the study was provided with an exempt status by the University of Pennsylvania institutional review board.

Variables

Data were extracted from the 2002, 2004, 2006, 2008, and 2010 surveys on all participants aged 18 and older. Our outcome variable, HIV testing, was assessed by the yes/no question, “Have you ever been tested for HIV/AIDS?” Independent variables included demographic, socioeconomic factors, and access to primary care. Demographics included age (divided into five groups: 18–39, 40–49, 50–59, ≥60), gender, race/ethnicity (categorized as non-Latino White, non-Latino Black, Latino, Asian, and other), and marital status (married, living with partner, single, other). Socioeconomic factors included education level, poverty level, and insurance status. Education level was categorized as less than high school, high school, between high school and a 4 year college, or more than a 4 year college. Poverty level was defined as being below 100% of federal poverty lines, which in 2010 translated to annual earnings of less than \$10,830 for an individual or less than \$22,050 for a family of four. Insurance was classified as private/work, Medicare, Medicaid, Veterans Affairs, and uninsured. People with both Medicare and Medicaid were categorized as Medicaid. Access to primary care was determined by the following questions: “Is there one person or place you usually go to when you are sick or want advice about your health?”; “When you go to the place you go most often, where do you usually go: to a private doctor’s office; a community health center; a hospital outpatient clinic; a hospital emergency room (ER), or some other place?” If survey respondents went to a private clinic, a community health center, or a hospital outpatient clinic for their care, they were considered as having access to primary care. Primary source of care was divided into private clinic, community health center, Emergency Department (ED), or other. Hospital outpatient clinics were included in the “other” category. Number of ED visits was classified as 0 and 1 or more.

Statistical analyses

To examine trends in HIV testing over the five survey waves, a generalized linear model with a logit link and binomial distribution was estimated where the outcome was a binary indicator for whether each survey respondent in the corresponding survey wave received HIV testing. We choose a probability model over a prevalence rate model due to the ease in visualizing trends in probability over time. Multiple regression models were estimated, each including an indicator for the survey wave and one of the primary sociodemographic or access exposures of interest (e.g., race, gender, insurance status) and their interaction. Next, we evaluated the probability of testing during the 2002–2006 period to the 2008–2010 period in order to determine testing differences before and after the change in CDC recommendations. The regression result for each model was used to estimate adjusted predicted probabilities of HIV testing for each survey wave or policy period at each level of the exposure of interest to test for differences and visualize the

TABLE 1. HIV TESTING PREVALENCE BY DEMOGRAPHIC CHARACTERISTICS, SOUTHEASTERN PENNSYLVANIA HOUSEHOLD HEALTH SURVEY, 2002–2010

	<i>Total surveyed, n (%) n = 50,698</i>	<i>Overall % Tested, (95% CI)</i>	<i>% Tested in 2002–2006, (95% CI)</i>	<i>% Tested in 2008–2010, (95% CI)</i>	<i>p Value</i>
Year					<0.001
2002	9,866 (19.0)	42.1 (37.4–46.7)	–	–	
2004	10,214 (18.7)	40.0 (32.9–47.3)	–	–	
2006	9,858 (19.3)	42.8 (34.2–51.4)	–	–	
2008	9,739 (20.4)	46.0 (37.6–54.3)	–	–	
2010	9,568 (22.6)	51.4 (42.5–60.7)	–	–	
Age					0.597
18–39	17,993 (35.5)	63.4 (56.9–70.0)	60.3 (54.0–66.4)	68.9 (61.4–76.4)	
40–49	9,861 (19.4)	52.0 (44.7–59.2)	47.6 (41.2–54.0)	59.7 (50.8–68.7)	
50–59	10,241 (20.2)	35.9 (28.1–43.7)	31.5 (25.1–37.9)	41.2 (31.5–50.9)	
≥60	12,573 (24.8)	17.3 (12.1–22.6)	14.7 (9.6–19.7)	21.2 (15.2–27.1)	
Female	27,265 (53.8)	43.9 (35.9–51.9)	41.3 (34.1–48.5)	48.0 (38.7–57.4)	0.411
Race					0.012
White, non-Latino	35,109 (69.2)	37.3 (34.8–39.8)	35.2 (32.9–37.5)	40.6 (37.6–43.5)	
Black, non-Latino ^a	10,191 (20.1)	63.0 (60.4–65.7)	59.4 (56.9–61.9)	68.6 (65.1–72.1)	
Latino	2,712 (5.4)	63.8 (55.4–72.1)	60.8 (51.2–70.4)	68.0 (59.6–76.1)	
Asian	1,386 (2.7)	38.6 (34.5–42.6)	34.5 (31.2–37.8)	47.6 (39.2–56.0)	
Other	1,300 (2.6)	53.2 (45.5–60.9)	44.5 (35.9–53.2)	60.1 (52.1–68.1)	
Marital status					0.103
Married	28,001 (55.2)	40.3 (36.4–44.2)	38.0 (34.5–41.5)	44.0 (39.1–48.9)	
Living with partner	3,113 (6.1)	66.2 (57.5–74.9)	64.8 (55.7–74.0)	68.2 (59.3–77.1)	
Single	19,123 (37.8)	46.7 (37.3–56.0)	43.1 (34.4–51.7)	52.4 (41.7–63.0)	
Other	458 (0.9)	49.2 (35.0–63.5)	43.5 (29.5–57.5)	53.6 (39.0–68.4)	
Education					0.159
< HS 0–11	4,425 (8.7)	44.8 (33.7–56.0)	41.0 (29.7–52.2)	52.0 (40.7–63.1)	
HS graduate	15,874 (31.3)	41.0 (30.4–51.5)	37.7 (28.0–47.4)	46.2 (34.4–58.0)	
4-year college	28,033 (44.7)	46.8 (40.1–53.4)	44.4 (38.6–50.1)	50.3 (42.1–58.5)	
>4-year college	7,734 (15.3)	44.5 (39.5–49.4)	42.2 (37.2–47.1)	47.7 (42.4–53.0)	
Insurance coverage					0.362
Private/work	30,052 (60.2)	46.1 (41.1–51.0)	43.2 (39.4–47.0)	50.0 (43.7–56.4)	
Medicare	13,086 (26.2)	30.8 (20.0–41.6)	28.1 (17.8–38.3)	65.0 (53.2–76.7)	
Medicaid	1,654 (3.3)	69.3 (59.6–78.9)	65.6 (54.5–76.8)	75.0 (67.1–83.0)	
Veterans Affairs	1,092 (2.2)	51.3 (41.7–61.0)	48.4 (37.2–59.6)	55.7 (45.7–65.6)	
Uninsured	4,031 (8.1)	58.1 (51.5–64.8)	53.3 (45.5–61.1)	64.5 (57.4–71.6)	
Access to primary care	45,260 (89.4)	43.9 (36.4–51.4)	41.1 (34.3–47.9)	48.2 (39.5–56.8)	0.562
Primary source of care					0.134
Private clinic	39,761 (78.4)	41.4 (35.9–47.0)	39.1 (34.1–44.2)	45.1 (38.5–51.6)	
CHC ^{a,b}	2,039 (4.0)	63.7 (57.1–79.3)	59.7 (53.3–66.1)	67.3 (59.8–74.8)	
ED [‡]	1,253 (2.5)	62.6 (57.1–68.2)	60.2 (52.8–67.5)	66.1 (62.2–70.0)	
Other	7,645 (15.1)	51.7 (43.9–59.5)	47.8 (41.1–54.5)	57.6 (47.5–67.7)	
≥1 ED visits	11,881 (24.2)	53.5 (44.5–62.5)	50.6 (41.4–59.8)	57.3 (48.3–66.3)	0.981

^aThe probability of HIV testing over time among Black, non-Latinos and patients attending CHC was associated with a $p < 0.05$ in our generalized linear model.

^bCHC, community health center; [‡]ED, emergency department.

trends in testing over time.^{21,22} Specifically, using the coefficients from the estimated logit models the following prediction equation was estimated: $\text{Probability}(\text{HIV testing in year } i) = 1 / (1 + e^{-(B_0 + B_1X_1 + B_2X_2 + B_3(X_1 * X_2))})$, where i indexes the year or policy period of the surveys, and the terms of the prediction model were the indicator for the survey wave and the primary sociodemographic or access exposures of interest (e.g., race, gender, insurance status) and their interaction. Confidence intervals of the predicted probabilities were generated using standard errors estimated using the delta method. All descriptive statistics and regression analyses

TABLE 2. ODDS OF HIV TESTING IN LATER YEARS COMPARED TO 2002, SOUTHEASTERN PENNSYLVANIA HOUSEHOLD HEALTH SURVEY

	<i>Odds ratio, 95% CI</i>
2002	ref
2004	0.92 (0.82–1.03)
2006	1.03 (0.86–1.23)
2008	1.17 (1.00–1.37)
2010	1.47 (1.22–1.76)

FIG. 1. The curves represent the predicted probability of HIV testing between 2002 and 2010 using HIV testing data from the Southeastern Pennsylvania Household Survey, a biennial telephone survey of 50,698 adults in Pennsylvania. The sample is representative of the region sampled. CHC, community health center; ED, emergency department.

FIG. 1. (Continued)

used balancing weights specific to the SEPA Household Health Survey accounting for race, age, gender, household size, and income based on US Census data. Data analyses were done using STATA 12.

Results

Between 2002 and 2010, 50,698 adults were surveyed, roughly 10,000 people per survey year (Table 1). The majority were female (53.8%), White (69.2%), and married (55.2%). Over 35% were 18–39 years old and 44.7% had a 4-year college degree. Nearly 10% of the sample lived below the federal poverty line, and 8% were uninsured. The majority of patients had access to primary care (89.4%), with most receiving care in a private clinic (78.4%).

In total, 97.1% of individuals responded to the HIV testing question. HIV testing gradually increased and significantly peaked in 2010, rising from 42.1% (95% CI, 37.4–46.7) in

2002 to 51.4% (95% CI 42.5–60.7) in 2010 (Table 1). Compared to 2002, the odds of HIV testing were: 3% higher in 2006 (95% CI 0.86–1.23), 17% higher in 2008 (95% CI 1.00–1.37), and 47% higher in 2010 (95% CI 1.22–1.76) (Table 2). When comparing the period preceding the CDC recommendation (2002–2006) to the post recommendation period, HIV testing increased overall by 33% (OR 1.33, 95% CI 1.23–1.44, $p < 0.001$). We performed a subanalysis excluding those aged 65 or older from the sample and found that HIV testing was higher in the remaining group (age 18–64): HIV testing was 48.5% (95% CI 43.6–53.3) in 2002 and rose to 58.8% (95% CI 49.6–67.9) in 2010.

HIV testing increased among all demographic and socioeconomic groups, but differences in testing which existed before 2006 persisted (Fig. 1). In 2002, the probability of HIV testing among people age 18–39 was 0.58 (95% CI 0.54–0.63) compared to 0.16 (95% CI 0.13–0.19) among those aged 60 or older. In 2010, the probability of HIV testing rose

to 0.70 (95% CI 0.62–0.78) among younger individuals (age 18–39) and to 0.25 (95% CI 0.19–0.30) among the elderly (age ≥ 60). The HIV testing probability in Blacks was 0.56 (95% CI 0.54–0.60) in 2002, which increased to 0.73 (95% CI 0.70–0.76) in 2010, compared to Whites in whom testing increased from 0.37 (95% CI 0.34–0.39) to 0.43 (95% CI 0.39–0.46). Compared to those with other insurance types, patients on Medicaid had a higher probability of HIV testing during the study period: testing increased from 0.74 (95% CI 0.68–0.81) to 0.82 (95% CI 0.75–0.89). Patients with private insurance had the lowest probability of HIV testing, with HIV testing increasing from 0.44 (95% CI 0.42–0.47) to 0.52 (95% CI 0.45–0.59). In 2002, the probability of HIV testing was 0.40 (95% CI 0.36–0.43) in private clinics, 0.57 (95% CI 0.47–0.66) in community health centers, and 0.68 (95% CI 0.40–0.97) in the ED. In 2010, testing increased to 0.47 (95% CI 0.40–0.54), 0.69 (95% CI 0.60–0.77), 0.74 (95% CI 0.60–0.87) in each respective location. The two groups in whom testing increased most rapidly were racial/ethnic minorities and patients receiving their care at community health centers.

Discussion

In a representative survey of a large metropolitan region, we observed a significant increase in HIV testing after the 2006 CDC recommendations. Between 2002 and 2010, HIV testing increased from 42% to 51%, with the greatest rise in testing among Blacks and patients receiving care from community health centers and the ED. Our findings are consistent with previously reported data which demonstrate increased testing specifically among Blacks.^{7,8,23} However, contrary to national trends showing stable HIV testing,^{4,24} we found that testing increased in Pennsylvania. Similarly, HIV testing rose in Washington DC, which, like Pennsylvania, received financial and structural support from the CDC-led Expanded Testing Initiative. Although HIV testing increased overall, differences in testing among demographic and socioeconomic groups persisted. Racial/ethnic minorities, younger individuals, and people on Medicaid were more likely to get tested before and after the CDC recommendations. This is perhaps because providers still apply risk-based screening or because they follow the recommendation to screen high risk groups yearly. We were unable to define some high risk groups such as MSM and IV drug abusers with our database; however, the HIV disease burden is known to be greater among racial/ethnic minorities and younger individuals.^{25,26}

There are advantages and disadvantages to this observed trend. First, because testing is being done in higher numbers among people disproportionately affected by HIV, the likelihood of detecting positive results is higher, therefore giving infected individuals the opportunity to enter care and initiate antiretroviral therapy.^{7,8} The disadvantage of preferentially targeting high-risk groups is that providers might not identify patients that they perceive as low-risk, therefore missing opportunities to diagnose HIV-infected persons and link them to care. It is known that physicians do a poor job taking sexual histories,^{27–29} and patients might not disclose high risk behaviors, which is in part the reasoning behind universal screening.

HIV testing gradually increased over time and was the highest in 2010, 4 years after publication of the CDC recommendations. This is not surprising since the literature on

organizational change suggests that it often takes time for guidelines to be implemented in clinical practice.^{30–32} Factors that could have slowed adherence to the CDC recommendations during the study time period include the persistence of policies at the state and health institution level in favor of a separate written informed consent for HIV testing, the lack of awareness of the CDC recommendations among physicians and patients,²⁴ the stigma associated with HIV testing,^{33,34} and challenges with financial reimbursement for opt-out testing.²⁴ Pennsylvania only removed the provision for written informed consent for HIV testing in 2011,⁵ a year after completion of our last survey wave. Old data indicate that states where consent procedures were either streamlined or eliminated saw increases in HIV testing compared to states where written informed-consent statutes were enforced.^{35–37} However, despite the burden of written informed consent, HIV testing rose significantly and on par with or better than national averages. Future studies should examine whether testing rates continued to rise in 2012 after removing the requirement for written consent. In April 2013, the US Preventive Services Task Force (USPSTF) revised its position on universal HIV testing from a grade C to grade A recommendation.^{38,39} The endorsement of the USPSTF will most likely result in increased awareness of the CDC recommendations among clinicians and the public at large and should facilitate financial reimbursement procedures. The Patient Protection and Affordable Care Act requires that qualified health plans provide at a minimum coverage without cost-sharing for preventive services rated A or B by the USPSTF; opt-out HIV testing now falls under that category.

Since 2006, there has been little information as to how access to care and healthcare setting impact HIV testing with the exception of the ED where HIV testing has been a success.^{40–42} Given efforts by the CDC to increase testing and link people to care, it is important to identify settings in which HIV testing needs improvement. Our study identifies the highest rates of testing in individuals receiving care from EDs and Community Health Centers and the lowest among individuals receiving care from private clinics. In 2007, the Philadelphia Department of Health (DOH) was one of 25 DOH in the nation to receive \$1.2 million from the CDC Expanded Testing Initiative to increase HIV testing in three federally qualified community health center systems, three EDs, and in Philadelphia jails.⁴³ In addition, this funding provided capacity building for a number of other EDs. Example programs include universal HIV screening in the ED with trained ED workers performing rapid HIV testing and informing patients of their results while waiting to be assessed by their physician.^{44–46} Around this time period, the CDC also initiated its “Take Charge Take Control” social marketing campaign targeting African American women with HIV testing messages. The combination of social marketing, capacity building, and the publication of the 2006 CDC guidelines most likely helped to improve HIV testing rates in these locations and helps to explain our findings.

As opposed to the ED, there is less literature on the successful implementation of opt-out testing in community health centers. A study performed by the U.S. Office of Inspector General in 324 Health Resources and Services Administration (HRSA) funded health center sites found that only 20% of sites followed all provisions of the CDC recommendations.⁴⁷ HRSA sites where funding for HIV testing

was available were more likely to adopt opt-out testing. In another study, provider initiated discussion about HIV testing was found to be low among Hispanic patients seeking care in community health centers in Harris County, Texas.⁴⁸ In our study, we found that HIV testing was the lowest in private clinics. Since the majority of patients are cared for by private practitioners, there needs to be more educational efforts and dedicated resources to improving HIV testing in these settings. Again, the endorsement of the USPSTF for opt-out testing and the elimination of a separate written consent for HIV testing will hopefully result in improved rates of HIV testing in private clinics.

Our study has several limitations. First, it relies on self reporting of HIV testing which can be subject to recall bias. However, given that written consent was still required at the time of survey administration, this is less likely. In addition, some questions may be subject to overestimates or underestimates if respondents gave answers they feel are socially acceptable. We were unable to identify high risk patients, and given that the SEPA Household Survey is cross-sectional, it is impossible to follow people longitudinally and determine if high risk patients received yearly HIV testing. Although a small proportion of the telephone interviews were done by cellular phone during the last two surveys, it is possible that people with cellular phones had different sociodemographic characteristics than people with landlines that we could not account for. Our study findings apply only to the population sampled and other large metropolitan areas with similar patient demographics, but cannot be generalizable to the entire US population. Lastly, because sexual orientation was not included in the SEPA Health Household Survey, we were not able to assess the trends of HIV testing among Black MSM, a group where HIV incidence is sharply increasing.

Universal HIV testing is the first step in the HIV treatment cascade⁴⁹ that leads to HIV diagnosis and linkage to care. In accordance with previous reports, we demonstrate that HIV testing has significantly increased since the 2006 CDC recommendations, particularly among non-Hispanic Blacks and among patients seeking care in community health centers and the ED. Primary care physicians need to improve HIV testing rates, especially those practicing in private clinics.

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Author Disclosure Statement

All authors declare that there are no conflicting financial interests.

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