Low Perceived Risk and High HIV Prevalence Among a Predominantly African American Population Participating in Philadelphia's Rapid HIV Testing Program

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Abstract

African Americans are disproportionately infected with HIV/AIDS. Despite Centers for Disease Control and Prevention (CDC) guidelines recommending routine opt-out testing for HIV, most HIV screening is based on self-perceived HIV risks. Philadelphia launched a rapid HIV testing program in seven public health clinics in 2007. The program provides free rapid oral HIV tests to all patients presenting for health services who provide informed consent. We analyzed demographic, risk behavior, and HIV serostatus data collected during the program between September 2007 and January 2009. We used multivariable logistic regression to estimate the association between behavioral and demographic factors and newly diagnosed HIV infection. Of the 5871 individuals testing for HIV, 47% were male, 88% were African American, and the mean age was 34.7 years. Overall HIV prevalence was 1.1%. All positive tests represented new HIV diagnoses, and 72% of individuals reported testing previously. Approximately 90% of HIV-positive individuals and 92% of individuals with more than five recent sex partners never, or only sometimes, used condoms. Two thirds of individuals testing positive and 87% of individuals testing negative assessed their own HIV risk as zero or low. Individuals reporting cocaine use and ever having a same sex partner both had 2.6 times greater odds of testing positive. Condom use in this population was low, even among high-risk individuals. Philadelphia's program successfully provided HIV testing to many underserved African Americans who underestimate their HIV risk. Our results nevertheless suggest greater efforts are needed to encourage more individuals to undergo HIV testing in Philadelphia, particularly those who have never tested.

Introduction

OVER 1 MILLION AMERICANS live with HIV/AIDS, more than 20% of whom do not know they are infected.[1] Although African Americans represent 13% of the U.S. population, they account for approximately 45% of new HIV infections, and the rate of HIV infection among African Americans is seven times that of white Americans.[1] Individuals who do not know their HIV status may unknowingly transmit the virus[2–6]; more than half of new infections in the United States are spread by HIV-positive individuals who do not know they are infected.[7,8] Several studies have found that knowing one's HIV status can lead to a reduction in high-risk sexual behavior.[9–12] Furthermore, individuals who have been diagnosed with HIV are more likely to initiate highly active antiretroviral therapy (HAART), which lowers viral load and decreases the risk of HIV transmission.[13]

Although African Americans test for HIV at higher rates than individuals of other races,[14–18] they are significantly more likely to present for HIV testing late in their course of infection,[7] and the rate of AIDS diagnoses is 10 times higher among African Americans than among whites.[19] African Americans with HIV are also less likely to receive antiretroviral therapy than people of other races.[20] In 2006, AIDS-related mortality was almost 2 times higher for African Americans than for whites.[21]

To address nationwide underdiagnosis of HIV and these alarming health disparities, the Centers for Disease Control and Prevention (CDC) adopted routine opt-out HIV screening guidelines for all patients ages 13–64 in medical settings, irrespective of HIV risk. In an effort to reduce barriers to testing, these new recommendations eliminate previous requirements to accompany each HIV test with pretest counseling and separate written informed consent.[22]

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Philadelphia's HIV incidence rate is 114 per 100,000 people, approximately five times the national average and the sixth highest of any metropolitan region nationwide.[23] Although 43% of the population in Philadelphia is African American,[24] of 1123 new HIV cases diagnosed in Philadelphia in 2006, 780 (69%) were among African Americans.[23] In 2007, to address the city's high rates of HIV incidence and to comply with the new CDC guidelines, Philadelphia introduced a city-wide rapid testing program in public health clinics. The program has focused on uninsured and underinsured individuals with limited or no access to health services, many of whom are African American. Philadelphia's program has been implemented with financial support from the state of Pennsylvania and a CDC grant for metropolitan areas most affected by HIV/AIDS. We assessed actual and perceived risks in individuals undergoing rapid HIV testing in Philadelphia's program, analyzed behavioral and demographic factors associated with newly diagnosed cases of HIV, and explain the important role of Philadelphia's rapid HIV testing program in diagnosing African Americans.

Methods

Testing protocols

In June 2007, seven of the Philadelphia Department of Public Health's public sexually transmitted infection (STI) and primary care clinics began routinely offering rapid HIV tests during all clinical visits.

The Philadelphia Department of Public Health and the Lifespan Institutional Review Board (IRB) of the Miriam Hospital at Brown University provided approval for this evaluation. Medical assistants administered the OraQuick® Advance HIV 1/2 rapid HIV test (Bethlehem, PA) using an oral mucosal transudate specimen obtained by an oral swab in private counseling rooms. Laws governing HIV testing in the state of Pennsylvania still require written consent and HIV counseling[25]; all patients completing HIV testing provided verbal and written informed consent. Risk reduction and prevention counseling was provided during each HIV testing session. Patients remained in waiting areas while the specimen was tested. Consent, counseling and testing usually were completed within 30 min. Patients with positive reactive tests were informed that their results were preliminary positive and that confirmatory testing would be necessary to confirm their diagnoses. All patients testing positive immediately underwent confirmatory testing with both the Orasure® Advance HIV 1/2 rapid HIV fingerprick test as well as an enzyme immunoassay (EIA), followed by a Western blot assay. An individual was determined to be positive for HIV if all three testing modalities were positive. Patients were asked to return for confirmatory results and present for follow-up medical services in 1 week. Patients not presenting for confirmatory results were contacted by telephone and encouraged to return to the clinic to receive confirmatory results.

Patients underwent standardized HIV risk reduction counseling. Testing staff used standardized HIV counseling and testing surveys that included demographic and HIV risk behavior questions. Participants were asked to self-identify their race in accordance with CDC guidelines. Questions about HIV risk behaviors included questions about drug and alcohol use, number and gender of sex partners, and condom use history. Prior to testing and following counseling, patients were also asked to rate their perceived HIV risk on a four-point scale as none, low, medium, or high. After completing counseling sessions, testing staff also rated all patients' HIV risks on a four-point scale as zero, low, medium, or high. Data were entered into a large, secured database.

We evaluated the risk behaviors, perceived HIV risks and testing outcomes among all non-foreign–born individuals undergoing rapid HIV testing in Philadelphia's public testing program between August 2007 and March 2009. Because this was an HIV testing program rather than a research study, data were not collected for individuals declining testing.

Data analysis

Our analysis was restricted to individuals with no history of a previously confirmed HIV diagnosis. Prevalent cases of HIV were excluded to ensure all positive diagnoses during the evaluation period were incident cases. All individuals previously tested as part of the rapid testing program were excluded from our analysis. Demographic and behavioral variables were stratified by sex and compared using a χ^2 test. We fitted logistic regression models for two outcomes: perceived HIV risk, defined as a response of moderate or high, and incident HIV diagnosis. Several demographic and behavioral variables were assessed as predictors for each outcome. Likelihood ratio tests were used to compare models to one that included all independent variables presumed to be associated with self-perception of HIV risk and new HIV diagnoses. We determined *a priori* that race, gender, age, and condom use would be included in all final models due to the strong potential for these variables to confound observed associations. Results were reported as odds ratios (OR) with 95% confidence intervals (CI). In order to examine associations between condom use, HIV risk and HIV serostatus, we analyzed frequency of condom use for three variables: perceived HIV risk, number of sexual partners, and HIV status. We performed χ^2 analyses to examine differences in frequency of condom use across variable categories. All analyses were performed using STATA 10 (College Station, TX) statistical software.

Results

Between September 2007 and February 2009, 5871 unique individuals underwent rapid-testing for HIV in Philadelphia's public testing program. The vast majority (88%) of individuals reported their race as African American, and most (72%) reported having been previously tested for HIV. The mean age of the population was 34.7 years and the proportion of men and women were similar (47% versus 53%, respectively). Sixty-two individuals tested positive for HIV, yielding an overall HIV prevalence of 1.1% (Table 1). All 62 individuals testing positive represented new HIV diagnoses. While we do not have data on the number of individuals entering HIV care for this particular subpopulation of testers, 90% of all individuals who tested positive in this program since 2007 attended their first clinical visit.

Risk behaviors

Table 1 contains HIV-related risk factors reported in the questionnaires administered at the time of testing, stratified by gender. More than a third of women and 27% of men

TABLE 1. DEMOGRAPHICS AND HIV-RELATED RISK FACTORS[a]

Risk factor	Male n (%)	Female n (%)	p Value
Age (years)[b]	35.6 (14.1); 34	33.9 (14.1); 30	
Race			0.29
African American/ black	2466 (88.7)	2695 (87.3)	
White	130 (4.7)	153 (4.9)	
Asian	180 (6.5)	238 (7.7)	
Other	2 (0.07)	3 (0.1)	
No response	1 (0.03)	0	
Drug use (ever)[c]			
Heroin	113 (4.1)	61 (2.0)	<0.001
Cocaine	472 (16.7)	397 (12.7)	<0.001
Marijuana	1492 (53.7)	1204 (39)	<0.001
Poly-substance use	471 (17)	341 (11)	<0.001
Alcohol use (ever)			<0.001
Yes	1734 (62.4)	1672 (54.1)	
No	447 (16.1)	373 (12.1)	
No response	598 (21.5)	1044 (33.8)	
Traded sex for money or drugs (ever)			<0.001
Yes	139 (5.0)	330 (10.7)	
No	2631 (94.7)	2752 (89.1)	
No response	9 (0.3)	7 (0.2)	
Same sex partner (ever)			0.36
Yes	195 (7.0)	247 (8.0)	
No	2539 (91.4)	2790 (90.3)	
No response	45 (1.6)	52 (1.7)	
Sexually active in past 12 months			0.27
Yes	2364 (85.1)	2582 (83.6)	
No	409 (14.7)	500 (16.2)	
No response	6 (0.2)	7 (.2)	
Condom use			<0.001
Always	288 (10.4)	348 (11.3)	
Sometimes	1706 (61.4)	1533 (49.6)	
Never	754 (27.1)	1161 (37.6)	
No response	31 (1.1)	47 (1.5)	
Previous STI			0.79
Yes	498 (17.9)	565 (18.3)	
No	557 (20)	612 (19.8)	
Don't know	344 (12.4)	358 (11.6)	
No response	1380 (49.7)	1554 (50.3)	
Number of sexual partners in last 12 months			<0.001
<5	2173 (78.2)	2668 (86.4)	
>5	436 (15.7)	122 (3.9)	
0	168 (6.0)	295 (9.6)	
No response	2 (0.1)	4 (0.1)	
Sexual preference			
Heterosexual	2694 (96.9)	2968 (96.1)	
Homosexual (male)	46 (1.7)	1 (0.03)	
Homosexual (female)	0	57 (1.8)	
Bisexual	32 (1.2)	56 (1.8)	
Other/no response	7 (0.2)	7 (0.2)	

(continued)

TABLE 1. CONTINUED

Risk factor	Male n (%)	Female n (%)	p Value
Previous HIV test (ever)			<0.001
Yes	1932 (69.5)	2292 (74.2)	
No	788 (28.4)	763 (24.7)	
Don't know/ no response	59 (2.1)	34 (1.1)	
HIV positive			<0.001
Yes	35 (1.3)	27 (0.9)	
No	2744 (98.7)	3062 (99.1)	
Self-reported perceived HIV risk			0.15
None	944 (34.0)	1210 (39.2)	
Low	1429 (51.4)	1515 (49)	
Moderate	303 (10.9)	255 (8.3)	
High	100 (3.6)	101 (3.3)	
No response	3 (0.1)	8 (0.2)	
Medical assistant's reported patient HIV risk			<0.001
None	164 (5.9)	319 (10.3)	
Low	1514 (54.5)	1901 (61.6)	
Moderate	753 (27.1)	661 (21.4)	
High	322 (11.6)	171 (5.5)	
No response	26 (0.9)	37 (1.2)	<0.001

[a]Excluded from analysis were 2 individuals who did not provide gender data and 1 individual who identified as transgender.
[b]Mean (standard deviation); median.
[c]Not reported: 1317 individuals reported no drug use or did not provide drug use data.
STI, sexually transmitted infection.

reported never using a condom during sex, and 55% of the population (61% of men and 50% of women) reported using condoms sometimes during sex ($p < 0.001$). Nearly four times as many men as women had more than five sex partners in the last 12 months (16% versus 4%, $p < 0.001$), and 5% and 11% of men and women, respectively, reported exchanging sex for money or drugs ($p < 0.001$). Among those reporting more than five sex partners in the past 12 months, 92% reported never or only sometimes using condoms (Table 2). The vast majority of both men and women self-identified as heterosexual; 7% and 8% reported same sex partners, respectively. Differences in drug and alcohol use were reported between men and women; the largest observed difference was for marijuana use (54% for men and 39% for women, $p < 0.001$). Approximately 4% of men and 2% of women reported heroin use.

Perceived HIV risk

Approximately 4% of men and 3% of women self-reported their own HIV risk as high, while medical assistants perceived that 12% of men and 6% of women were at high risk for contracting HIV (Table 1). Approximately 85% of men and 88% of women believed they had zero or low risk of HIV infection, compared to medical staff's perception that 60% of men and 72% of women were at zero or low risk of infection.

TABLE 2. BIVARIATE ASSOCIATION BETWEEN CONDOM USE, PERCEIVED RISK FOR HIV, NUMBER OF SELF-REPORTED
SEXUAL PARTNERS AND INCIDENT HIV CASES[a]

	Perceived risk for HIV		Number of partners			Incident HIV cases	
	None/low	Moderate/high	0	<5	>5	Positive	Negative
	n (%)		n (%)			n (%)	
Condom use							
Always	562 (88.2)	75 (11.8)	64 (10.0)	531 (83.4)	42 (6.6)	6 (0.9)	631 (99.1)
Sometimes	2749 (84.9)	490 (15.1)	130 (4)	2660 (82.1)	449(13.9)	34 (1.0)	3205 (99.0)
Never	1722 (89.9)	193 (10.1)	204 (10.7)	1645 (85.9)	66 (3.4)	22 (1.1)	1893 (98.9)
p Value	<0.001		<0.001			0.89	

[a]Eighty missing values excluded from analysis, $n = 5791$.

Among individuals reporting never using condoms during sex, 90% perceived themselves to be at zero or low risk of HIV infection (Table 2).

To examine whether individuals engaging in high-risk behaviors perceived themselves at risk for HIV infection, we examined potential associations between reported risk factors and perceived risk for HIV infection. Variables included in the final models for self-perceived HIV risk are shown in Table 3. A history of STI was associated with a reduced odds of having a moderate or high perception of HIV risk (OR = 0.55; 95% CI

TABLE 3. MULTIVARIABLE LOGISTIC REGRESSION ANALYSES: PREDICTORS OF PERCEIVED RISK
FOR HIV INFECTION AND PREDICTORS OF INCIDENT HIV INFECTION

Model variable	Predictors of individual's perceived risk for HIV infection (moderate/high) Odds ratio (95% CI)	Predictors of incident HIV infection Odds ratio (95% CI)
Race		
African American race	0.81 (0.62–1.05)	1.02 (0.99–1.03)
Other race/ethnicity	1.0	1.0
Gender		
Female	1.11 (0.93–1.32)	0.73 (0.43–1.25)
Male	1.0	1.0
Age (years)	0.99 (0.99–1.0)	1.01 (0.99–1.03)
Condom use		
Never	0.90 (0.74–1.10)	1.21 (0.69–2.11)
Always/sometimes	1.0	1.0
Previous history of STI		
Yes	0.55 (0.45–0.68)	1.53 (0.86–2.70)
No	1.0	1.0
Previous HIV test		
Yes	N/A	0.45 (0.25–0.79)
No		1.0
Number of sexual partners		
<5	1.68 (0.97–2.90)	0.62 (0.22–1.70)
>5	2.82 (1.56–5.10)	0.20 (0.05–0.76)
0	1.0	1.0
Cocaine use		
Yes	N/A	2.40 (1.30–4.46)
No		1.0
Self-reported perceived HIV risk		
Moderate/high	N/A	1.85 (1.02–3.36)
None/low		1.0
Tester's perceived client risk		
Moderate/high	8.1 (6.71–9.84)	4.21 (2.21–7.99)
None/low	1.0	1.0
HIV positive		
Yes	1.87 (1.04–3.37)	N/A
No	1.0	
Same sex partner		
Yes	N/A	2.59 (1.33–5.03)
No		1.0

STI, sexually transmitted infection.

0.45–0.68). The odds of perceiving one's own HIV risk as high was 2.8 greater if more than five sex partners were reported, and 1.9 times greater for HIV positive participants (95% CI: 1.56–5.10, 1.04–3.37, respectively). There was wide discrepancy between an individual's perceived risk and the medical assistant's risk assessment; individuals who perceived their HIV risks as zero or low were frequently at high risk for contracting HIV. There was an 8.1 times greater odds of the individual believing (s)he was at moderate or high risk (95% CI: 6.71–9.84) if the medical assistant assessed his or her HIV risk as moderate or high.

Predictors of HIV Infection

We also examined specific predictors for incident HIV infection through multivariable analyses (Table 3). HIV testers' assessment of HIV risk was the strongest predictor of HIV-infection in the model. In individuals for whom the medical assistant rated at moderate or high risk for HIV infection, there was a 4.2 greater odds of being HIV infected (95% CI: 2.21–7.99). There was a 2.4 times greater odds of testing HIV positive associated with cocaine use, and a 2.6 times greater odds associated with having a same sex partner (95% CI: 1.30–4.46, 1.33–5.03, respectively).

Individuals reporting more than five sexual partners were less likely to be HIV-positive compared to individuals reporting fewer than five sexual partners (OR = 0.20; 95% CI: 0.05–0.76). Additionally, reporting a previous HIV test was associated with decreased odds of HIV infection (OR = 0.45; 95% CI: 0.25–0.79). Self-perceived moderate or high-risk for becoming infected with HIV was marginally associated with incident infection (OR: 1.85, 95% CI: 1.02–3.36).

It is noteworthy that 90% (56/62) of all HIV-positive individuals reported either never or only sometimes using condoms. Although not statistically significant, it is particularly relevant given that 69% of HIV-positive individuals included in our analysis perceived themselves to be at no or low risk for HIV infection compared with HIV 87% of HIV-negative individuals ($p < 0.001$, data not shown).

Discussion

The rapid HIV testing program in Philadelphia identified a population exhibiting multiple high-risk behaviors, including low rates of condom use, substance use, and exchanging sex for money or drugs. However, individuals engaging in high-risk behaviors typically did not perceive themselves at risk for contracting HIV. In our sample, many individuals never used condoms and a large proportion of the others only used condoms infrequently; only 11% of individuals reported always using condoms. Many also reported more than five sexual partners, and individuals reporting more than five sexual partners were more likely to perceive their HIV risk as zero or low and less likely to use condoms. Interestingly, having more than five sexual partners was not associated with increased risk of HIV infection in this population. This may be attributable to the fact that data on the number of sexual partners had limited specificity because of the way number of sexual partners were categorized during data collection (0, less than 5, and more than 5); this limited our ability to analyze the impact of incremental increases in sexual partners on newly diagnosed HIV infection.

It is noteworthy that cocaine use and having a same sex partner were the strongest predictors of testing positive for HIV in this urban population. These findings suggest that sexual networks among drug users and MSM may be equally or more important than numbers of sexual partners in predicting HIV infection in this population. This finding is similar to those in other recent studies among African American populations with high infection rates; for example, an analysis in nearby Washington, D.C. found that nontraditional sexual risk factors such as sexual networks and disclosure of sexual preference among MSM may contribute to elevated HIV rates among African American men.[26] These trends suggest that in addition to the provision of routine testing, primary prevention programs in Philadelphia should focus on sexual networks, particularly those of MSM and illicit drug users.

Individuals testing HIV positive dramatically underestimated their own HIV risk; two thirds of individuals who tested HIV positive believed they were at zero or low risk for contracting HIV. Additionally, the overwhelming majority of individuals who tested HIV positive did not report consistent condom use. In spite of these reported high-risk behaviors, many individuals undergoing rapid testing for HIV in Philadelphia believed they were at low risk for contracting HIV. Wide discrepancies existed between individuals' self-perception of HIV risk and medical assistants' perceptions of HIV risks; individuals who perceived their HIV risks as zero or low were frequently at high risk for contracting HIV. The exception to this finding was the small group of individuals who perceived themselves at moderate or high risk; these individuals were also perceived as high risk by medical assistants. Individuals reporting a previous STI diagnosis were more likely to perceive their HIV-risk to be low, suggesting that individuals in this population frequently engage in high-risk sexual behaviors but do not fully appreciate the connection between their behaviors and risks of acquiring HIV infection. Low perceived HIV risks in this population may explain low rates of condom use; in turn, low rates of condom use may potentiate the spread of HIV infection in this population.

Taken together, our findings suggest that self-perceived HIV risk is an insensitive criterion for HIV screening in this urban, predominately African American population. This is supported by other research that finds low perceived risks among African Americans undergoing testing in high prevalence settings.[27] Our findings support the CDC's guidelines for routine opt-out testing for all Americans aged 13–64,[27] and underscore the need for routine, opt-out testing in public clinics, which can effectively diagnose individuals who may underestimate their HIV risks. Moreover, because stigma can inhibit persons from seeking HIV testing, routine testing can also help destigmatize HIV testing.

Most individuals (72%) testing in Philadelphia's program reported having previously tested for HIV. This is unsurprising given that the population was overwhelmingly African American; other research demonstrates that African Americans typically test for HIV more frequently than individuals of other races.[14–18] Although the survey did not ask where or when individuals previously tested for HIV, high prevalence of repeat testing and repeat testers' reduced odds of testing HIV-positive suggests that populations at high risk for contracting HIV are taking advantage of public HIV testing programs in Philadelphia.

Additionally, although rates of new HIV diagnosis in this population are higher than national averages, city-wide HIV incidence in Philadelphia is 114 per 100,000, the sixth highest of any metropolitan area in the nation.[23] While the rapid testing program has reached many high-risk individuals, high city-wide incidence rates suggest that even greater efforts are needed to encourage more individuals to undergo HIV testing in Philadelphia. A successful door-to-door rapid HIV testing program among Latinos in North Carolina may offer important lessons for Philadelphia.[28]

Our findings are subject to several limitations. Because our results are based on a brief questionnaire developed for programmatic rather than research purposes, questions related to several HIV risk behaviors were somewhat limited. For example, data on route of administration of drug use were not collected, and HIV risk behavior questions inquired about "ever" use of drugs rather than questions about recent use. Similarly, because questions about condom use were defined as "never, sometimes, and always" and the number of sexual partners in the last year was defined as "zero, less than 5, or more than 5," we cannot estimate independent risks associated with marginal changes in condom use or number of sexual partners. Additionally, because the testing program did not utilize a standardized risk assessment instrument, both participant and medical assistants' risk assessments may be subject to some misclassification of risk category. Because this was a testing program evaluation rather than a research study, we also did not measure changes in risk behaviors, risk perception, and testing frequency longitudinally; it is therefore difficult to assess whether the testing program increased citywide HIV testing or reduced risk-taking behaviors.

Finally, because we do not know who has not presented for testing, it is difficult to know whether these results are generalizable to the broader Philadelphia city population. However, this large sample represents the entire population of individuals undergoing rapid HIV testing during Philadelphia's public HIV testing program over a more than 2-year period.

Despite CDC guidelines, most HIV screening in the United States is still based on self-reported HIV risk. Nationwide budget constraints continue to present challenges to implementing routine HIV testing. To date, CDC guidelines have not been accompanied with expansion of the Ryan White Program, a federal program that finances HIV-related health services in cities, states, and local community-based organizations. Until recently, neither has the US Department of Health and Human Services (HRSA) nor the Centers for Medicare and Medicaid (CMS) financed opt-out testing programs recommended by the CDC. Rather, small programs have been sporadically financed by the CDC or state and city governments, including a new CDC program to expand rapid HIV testing that prioritizes expanding testing for African Americans.[29] However, in September 2010, the CDC and Health and Human Services (HHS) announced that the 2010 Affordable Care Act's Prevention and Public Health Fund will allocate $30 million to expand HIV prevention programs outlined in President Obama's National AIDS Strategy, including $4.4 million for expanding HIV testing.[30]

The Philadelphia rapid HIV testing program experience suggests that routine HIV testing can be scaled and added as a complement to existing services in public clinics that serve urban populations. The Philadelphia experience suggests that routine, publicly financed HIV testing can play an important role in diagnosing HIV among high-risk individuals who do not otherwise have access to health services, particularly those who do not believe they are at risk for becoming infected. Expanding rapid HIV testing in urban areas should be an important public policy priority for achieving President Obama's goal of reducing racial disparities in HIV infection.[31]

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