

Dentists' Willingness to Provide Expanded HIV Screening in Oral Health Care Settings: Results From a Nationally Representative Survey

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The Centers for Disease Control and Prevention (CDC) estimates that more than 47 000 Americans are newly infected with HIV annually.¹ Early diagnosis and timely initiation of care with highly active antiretroviral therapy have been shown to reduce HIV transmission, facilitate rapid access to antiretroviral therapy, and reduce morbidity and mortality among HIV-infected persons.²⁻⁷ Therefore, one of the goals of the National HIV/AIDS Strategy is to increase the percentage of people living with HIV who are aware of their status from 79% to 90%.⁸

In 2006, the CDC released revised national HIV testing guidelines to prioritize routine rapid screening of adults in US outpatient health care settings.⁹ Routine HIV screening of all Americans aged 15 to 65 years, regardless of their level of risk, has been given an A rating by the US Preventive Services Task Force, and HIV screening is fully reimbursed under the Patient Protection and Affordable Care Act of 2010.¹⁰⁻¹² Despite these supportive guidelines, approximately one fifth of the 1.2 million Americans living with HIV are unaware of their status.¹³ Widespread late testing limits the ability of prevention and treatment modalities to improve long-term prognosis, which, according to surveillance data taken from 40 states, caused 33% of persons who received an HIV diagnosis in 2008 to progress to an AIDS diagnosis within 1 year.¹⁴ A need therefore exists to consider expanding to additional health care settings that will facilitate the identification of people undiagnosed with HIV.

The dental setting has been recognized as a venue to identify at-risk individuals who may not otherwise access medical and public health systems.¹⁵⁻²¹ Prior research found that more than 70% of individuals who had never been HIV tested, yet who self-reported high HIV risk behaviors, had been in recent contact with

a dental provider.²¹ It is notable that dentistry is moving toward continued integration with other health care providers and expanding the incorporation of advanced and innovative diagnostic testing into dental practice, including salivary-based diagnostic testing.^{22,23}

Healthy People 2020's Oral Health Objective 14 proposes to "increase the proportion of adults who receive preventive interventions in dental offices," specifically proposing to "increase the proportion of adults who are tested and referred for glycemic control from a dentist or dental hygienist."²⁴ Many dentists are already collaborating with other members of the primary care team by offering medical screening tests and referring patients for definitive diagnosis and treatment of prevalent chronic diseases.^{20,25,26} Research efforts are also under way to develop salivary-based screening tests for hepatitis C, herpes simplex virus 1, hepatitis B, measles, rubella, mumps, and

cytomegalovirus.²⁶⁻²⁸ The contested nature of the dentist's role in HIV testing offers a valuable opportunity to expand the general role of oral health providers in screening for systemic diseases and in incorporating medical innovations into dental practice.

Recently conducted studies have explored patient and provider attitudes regarding HIV testing in the dental care setting. Data from patients suggest that many would be amenable to accepting the offer of a rapid oral HIV test in the dental setting.^{17,22,29} A recent survey of 288 dental clinic patients at the New Jersey Dental School and 182 patients from private dental practices in New Jersey and Arizona showed that 80% and 55% of respondents, respectively, responded favorably to the inclusion of HIV testing in their dental visit.²² This finding of potential acceptance among dental patients has also been validated by a New York University College of Dentistry study

Objectives. Using a nationally representative survey, we determined dentists' willingness to provide oral rapid HIV screening in the oral health care setting.

Methods. From November 2010 through November 2011, a nationally representative survey of general dentists (sampling frame obtained from American Dental Association Survey Center) examined barriers and facilitators to offering oral HIV rapid testing (n = 1802; 70.7% response). Multiple logistic regression analysis examined dentists' willingness to conduct this screening and perceived compatibility with their professional role.

Results. Agreement with the importance of annual testing for high-risk persons and familiarity with the Centers for Disease Control and Prevention's recommendations regarding routine HIV testing were positively associated with willingness to conduct such screening. Respondents' agreement with patients' acceptance of HIV testing and colleagues' improved perception of them were also positively associated with willingness.

Conclusions. Oral HIV rapid testing is potentially well suited to the dental setting. Although our analysis identified many predictors of dentists' willingness to offer screening, there are many barriers, including dentists' perceptions of patients' acceptance, that must be addressed before such screening is likely to be widely implemented. (*Am J Public Health.* 2014;104:872-880. doi:10.2105/AJPH.2013.301700)

of patients' acceptance of HIV testing in a university clinic, through which 88.2% of patients completed testing during their dental visit when offered it by a faculty member or a dental student.³⁰ A Harlem Hospital demonstration project implemented HIV testing in the dental setting with much success; 97.6% of dental patients who were approached agreed to be tested, leading to more than 3500 patient screenings in less than 2 years.³¹

Less is known about dental providers' willingness to embrace HIV rapid oral testing. Qualitative research has suggested that dentists have reported their lack of counseling skills, time constraints, concerns about financial reimbursement, privacy and confidentiality concerns, and issues related to scope of practice as potential barriers to their offering HIV testing in the dental care setting.^{20,25,32,33}

Within this context, our specific aims were to (1) identify barriers and facilitators associated with dentists' willingness to conduct HIV screening in the dental care setting and (2) investigate the perceived compatibility of HIV screening with dentists' professional role.

METHODS

We surveyed a nationally representative sample of dentists across the United States. The survey examined dentists' knowledge, attitudes, beliefs, and willingness regarding the possibility of offering routine HIV rapid testing in the dental care setting. We developed the survey using a modified version of the Theory of Planned Behavior as a heuristic framework. This framework posits that human action is guided by 3 types of considerations: (1) beliefs about likely outcomes of the behavior and evaluation of these outcomes, (2) beliefs about the normative expectations of others and motivation to comply with these expectations, and (3) beliefs about the presence of factors that may facilitate or impede performance of the behavior and perceived power of these factors.^{34,35} Our modified framework also encompassed a feedback loop pertaining to structural factors, such as reimbursement mechanisms, that could influence providers' knowledge, attitudes, and willingness to offer testing; in turn, dentists' willingness to offer HIV screening, and patients' demand for screening, may influence how other stakeholders develop

public health and financial policies toward HIV screening.

Participants

We obtained the sampling frame from the American Dental Association (ADA) Survey Center, which maintains a sample frame of professionally active dentists, dental students, and retired dentists independent of membership in the ADA. The ADA Survey Center provided a stratified random sample of dentists based on 2 variables: urbanicity and practice type. The type of practice variable mandated 2 separate strata: general dentists practicing in (1) private practice settings and (2) the public health sector. Private practitioners constitute 95% of all dentists surveyed by the ADA, a sample of roughly 130 000 individuals.

To capture dental practices in areas most prominently affected by the HIV epidemic, we drew 75% of the sample from Ryan White CARE Act eligible metropolitan areas (Ryan White CARE Act, Pub L No. 101–381, 104 Stat. 576, enacted August 18, 1990). The remaining 25% of the sample was taken from outside metropolitan areas as defined by Beale's Rural–Urban Continuum Code.³⁶ An additional stratum of sampled dentists consisted of 80% of the 383 dentists in the United States who identified by self-report as “public health dentists.” These individuals represent the professional group potentially most amenable to population screening.

Data Collection

The survey instrument consisted of 38 questions assessing HIV rapid testing, other screening behaviors and intentions, attitudes on HIV testing, subjective norms, perceived behavioral control, knowledge, background, demographics, dental practice, patient populations, and system and structural factors. In addition, we assessed perceived barriers to offering HIV testing in the dental care setting based on items derived from a qualitative elicitation study that was conducted to inform the survey development.²⁵ The National Opinion Research Center at the University of Chicago conducted the survey from November 2010 through November 2011. The survey contacted a sampling frame of 2876 dentists, using the standard 5 contacts in the order recommended by Dillman³⁷: prenotification letter, initial questionnaire mailing,

thank-you or reminder letter, signature-confirmed replacement questionnaire, and final follow-up via telephone. Working with staff at the National Opinion Research Center, we supplemented follow-up contacts with additional mass faxes, e-mail correspondences, and postcards. All methods of communication contained a toll-free number and e-mail address for respondents to use if assistance was needed. Additionally, respondents were given the option of completing the survey via a password-protected Internet site.

Each survey included an initial cash payment of \$10. Respondents who completed the survey in a timely fashion received an additional \$20. To increase the response rate, we offered chronic nonrespondents a bonus of \$50 as time progressed and a maximum of \$100 to hard-to-reach nonrespondents. Remuneration was provided only upon successful completion of the research study.

Measures

The 2 primary outcomes were (1) whether dentists were currently offering HIV rapid testing to their patients in their dental offices or clinics and (2) whether those dentists not currently offering testing would be willing to do so over the next year. In these analyses, the dependent variables were (1) a 0–1 indicator of whether the respondent currently offered HIV rapid testing and (2) a Likert³⁸ 5-point indicator of whether the respondent might be willing to offer HIV rapid testing in the future.

In the multivariable analysis, we also examined whether dentists were willing to offer HIV rapid oral testing and whether they believed this testing should be part of dentists' professional role. As guided by the Theory of Planned Behavior, we explored the influence of normative expectations of others (specifically, of other dental professionals and of patients), likely outcomes, and impeding or facilitating factors associated with HIV testing in the dental setting.

Statistical Analysis

In calculating descriptive statistics, we adjusted for the weighted and stratified nature of the sample using the SVY routines in Stata version 10.0 (StataCorp LP, College Station, TX). We performed unweighted multivariable analyses, incorporating variables used for stratification and weighting as covariates. We

TABLE 1—Stratified Survey Sample: American Dental Association Survey Center, 2010–2011

Stratum	Frame Counts, No.	Initial Sample Frame, No.	Respondents by Strata, No.	Ineligible Dentists, No.
General dentists, Ryan White eligible metropolitan areas	47 197	1875	1168	198
General dentists, non-Ryan White metropolitan areas	52 498	326	212	28
General dentists, non-Ryan White “micropolitan” areas	8143	164	112	13
General dentists, non-Ryan White rural areas	4036	164	116	17
Public health dentists	381	347	194	72
Total	112 255	2876	1802	328

^aRyan White CARE Act, Pub L No. 101-381, 104 Stat. 576, enacted August 18, 1990.

also included as covariates individual socio-demographic characteristics, characteristics of the dental setting and patient population, and personal experiences and knowledge regarding HIV. As a robustness check, we performed the multivariable regression analyses accounting for weighting and stratification. Point estimates were extremely similar to those reported. Multivariable analysis enabled investigation of and adjustment for potential confounders with examination of all binary outcomes. We used multiple logistic regression analysis to examine the ordinal dependent variables proposed by the theoretical model and ordinary least squares regression to examine continuous outcomes.

RESULTS

Among the 2876 dentists contacted, 328 were determined to be ineligible (either because of type of practice or expired or revoked dental license), 11 submitted incomplete surveys, and 735 were nonresponders (explicit refusals, unable to be located, or unavailable). In total, 1802 dentists completed interviews, for a response rate among eligible dentists of 70.7%. Most respondents completed the interviews via mail ($n = 1349$), and the rest responded via telephone ($n = 28$), fax ($n = 30$), Internet ($n = 381$), or in person ($n = 14$). A total of 1392 respondents completed the survey and received the standard incentive payment; an additional 31 received the \$50 incentive. A total of 379 completed the survey after receiving the \$100 maximum incentive payment.

Table 1 summarizes selection probabilities by survey strata. Base weights (the ratio of the initial sample frame to the total frame count

within each stratum) greatly varied across strata, underscoring the need for weights to obtain unbiased descriptive statistics that generalize to the full dental population. Response rates also varied by age and by other respondent characteristics. We computed probability weights that adjusted for such nonresponses.

Table 2 shows descriptive characteristics of our study sample. As noted in the “Methods” section, we computed descriptive statistics to account for the weighted and stratified nature of the sample.

The majority of respondents were male (78.3%) dentists employed in private group dental practices (65.4%) who did not accept Medicaid as a dental insurer (71.6%). Whites were the most represented racial/ethnic group (78.6%); they were also the least willing of all the races/ethnicities to offer rapid testing and the least likely to accept this testing as part of the dentist’s professional role.

Only 14 of 1802 dentists reported that they were currently offering HIV rapid testing, and these individuals exhibited significant agreement that doing so is part of the dentist’s professional role (67.6%). Fewer than 1 in 8 dentists appeared familiar with the 2006 revised CDC guidelines that recommend routine HIV screening of adults in US outpatient health care settings.

Dentists’ attitudes about the importance of generalized, widespread HIV testing (assessed by agreeing with a statement about the “importance for all persons 13 years and older to get tested at least once”) and their prior experience recommending HIV testing to patients were significantly associated with their willingness to offer oral rapid testing and accepting this as part of the dentist’s role. Having patients

with a known positive serostatus, however, was not a significant factor.

The perceived normative expectations of others were especially influential in the bivariate analysis; respondents’ willingness to offer testing and acceptance of it as part of their profession were significantly correlated with agreement that, if they were to offer testing, (1) patients would be accepting of HIV testing in the dental setting, (2) colleagues’ perceptions of them would improve, and (3) patients’ perceptions would improve, and disagreement with the statement that they would be concerned about negative reactions from patients.

Clinical knowledge and previous training in HIV disease were not significantly associated with dentists’ willingness to offer rapid HIV testing. They were, however, significantly associated with acceptance of HIV testing as part of the dental professional’s role.

Table 3 shows our multiple logistic regression results. Dentists who agreed that provision of rapid oral screening would improve their professional standing among colleagues reported greater willingness to screen (odds ratio [OR] = 1.57; 95% confidence interval [CI] = 1.16, 2.11) and more acceptance of HIV testing as part of their role (OR = 1.93; 95% CI = 1.42, 2.62). Similar patterns existed regarding the perceived preferences of dental patients; those who strongly agreed that patients’ perceptions of them would improve were more than 4 times as likely to perceive this testing as part of their role, whereas those who strongly disagreed were significantly less likely to offer HIV rapid testing willingly (OR = 0.18; 95% CI = 0.07, 0.46) or to accept testing as part of the dentist’s role (OR = 0.06; 95% CI = 0.02, 0.25).

TABLE 2—Dentists' Attitudes Toward HIV Testing in Dental Setting, by Dentists' Characteristics: American Dental Association Survey Center, 2010–2011

Dentists' Characteristics	Overall		Willing to Offer HIV Testing		Believes HIV Testing Part of Dental Role	
	No.	% (Weighted)	% (Weighted)	P	% (Weighted)	P
Overall	1802		56.7		40.0	
Age, y						
20–30	40	2.1	74.2	.2	43.8	.55
31–40	289	16.9	55.1		34.1	
41–50	423	22.7	64.4		42.3	
51–60	611	34.5	55.8		39.7	
61–70	232	19.2	65.2		44.7	
≥ 71	83	4.6	58.5		46.6	
Gender						
Male	1347	78.3	58.7	.2	41.0	.72
Female	439	21.7	64.5		39.5	
Race						
White	1298	78.6	57.8	.04	37.6	< .001
Hispanic	106	4.2	75.8		66.2	
African American	93	3.5	76.5		68.4	
Asian American	264	14.2	65.2		46.1	
Other	84	2.9	70.1		56.7	
Year of DDS or DMD degree						
Before 1970	128	7.3	53	.88	45.7	.92
1970–1979	444	25.0	60.2		39.9	
1980–1989	581	33.6	61.2		41.6	
1990–1999	335	17.5	61.3		38.7	
≥ 2000	279	16.6	59.8		39.9	
Dental setting						
Private solo	1063	30.0	59.7	.88	40.8	.72
Private group	465	65.4	60.7		39.7	
Public health	194	0.3	73.1		54.2	
Other	80	4.3	62.3		46.1	
Medicaid patients						
None	1236	71.6	58.4	.16	38.8	.06
≥ 1	528	28.4	64.1		46.4	
Currently offer HIV oral or blood rapid test						
No	1788	99.3	56.7		39.9	.03
Yes	14	0.35	NA		67.6	
Had patients whom they knew had HIV/AIDS (in past 5 y)						
No	584	33.0	57.1	.24	38.8	.42
Yes	1218	67.0	61.6		41.8	
Importance of all persons 13 y and older getting HIV tested at least once						
Not important	200	12.0	34.2	< .001	16.5	< .001
Somewhat unimportant	410	24.6	52.8		30.6	
Somewhat important	747	42.4	64.7		41.0	
Important	423	20.9	74.3		65.6	
Ever recommended HIV testing to a patient						
No	1419	82.4	58.4	.02	36.7	< .001
Yes	342	17.6	69.7		59.4	

Continued

TABLE 2—Continued

Familiar with CDC's 2006 Revised Recommendations						
No	1505	88.3	59.7	.51	39.6	.06
Yes	241	11.7	63.4		49.4	
Patients will accept HIV test in dental setting						
Disagree	1455	83.3	54.4	< .001	32.9	< .001
Agree	325	16.7	86.8		78.0	
If they were to offer testing, colleagues' perceptions of them would improve						
Disagree	930	58.5	47.6	< .001	26.2	< .001
Agree	806	41.5	80		62.6	
If they were to offer testing, patients' perceptions of them would improve						
Disagree	777	50.5	45.2	< .001	21.2	< .001
Agree	957	49.5	76.6		61.3	
If they were to offer testing, would be concerned about negative reactions from their patients						
Disagree	618	32.9	75.2	< .001	58.8	< .001
Agree	1142	67.1	53.8		32.8	
Training received in HIV testing and counseling						
None	1189	70.6	57.9	.26	37.6	.04
< 1 h	258	12.5	67.4		46.1	
1-4 h	212	10.8	68.9		53.0	
5-8 h	58	3.0	56.1		43.4	
> 8 h	60	3.2	60		54.8	
Clinical knowledge of HIV disease						
None or limited	304	17.4	56.6	.83	37.7	.01
Moderate	765	43.9	60.6		35.6	
Good	612	33.3	61.2		48.4	
Excellent	109	5.4	61.6		44.9	
Had some training on management of HIV in dental school						
No	1053	59.8	59.4	.64	42.4	.32
Yes	728	40.2	61.2		38.7	

Note. CDC = Centers for Disease Control and Prevention; DDS = doctor of dental science or surgery; DMD = doctor of dental medicine; NA = not applicable.

Dentists who perceived the greater public health urgency of HIV testing (assessed by agreeing that it is “very important” that all persons 13 years and older be tested for HIV at least once) were more likely to report that they were willing to provide such testing (OR = 1.56; 95% CI = 1.16, 2.10), and that rapid oral HIV testing is consistent with the dental role (OR = 1.81; 95% CI = 1.35, 2.45). Dentists who had in fact already recommended that a patient get tested for HIV in the past were more likely to accept this testing as part of their professional role (OR = 1.52; 95% CI = 1.12, 2.06).

African American dentists were more than twice as receptive as Non-Hispanic White dentists (OR = 2.18; CI = 1.24, 3.81) to rapid oral testing as part of the dentist's role. Older dentists appeared marginally more receptive to regarding rapid oral testing as part of the dentist's role (OR = 1.01; CI = 1.00, 1.03), although this attitude was not accompanied by greater apparent willingness to offer rapid oral testing.

Dentists practicing in non-Ryan White “micro-politan” and rural areas appeared less willing to perform HIV testing, a finding consistent with lower overall HIV prevalence in such communities. ADA members appeared slightly less

embracing of oral rapid HIV screening on 3 of the 4 measures; however, odds ratios were not statistically significant for these associations. Dentists' perceived clinical knowledge of treating patients with HIV also appeared to be an important variable, with “good” and “excellent” clinical knowledge associated with greater embrace of testing.

We also found reduced willingness to screen among dentists who required higher incentive payments to participate in the survey. Those requiring \$100 to participate were notably less willing to perform rapid HIV screening (OR = 0.71; CI = 0.55, 0.94) than those who required

TABLE 3—Multivariable Analysis of Dentists' Attitudes Toward HIV Testing in Dental Setting, by Dentists' Characteristics: American Dental Association Survey Center, 2010–2011

Respondent's Characteristics	Willing to Offer HIV Testing, OR (95% CI)	Believes HIV Testing Part of Dental Role, OR (95% CI)
Important that all persons 13 y and older get tested for HIV at least once		
Not important at all	0.47** (0.32, 0.67)	0.41** (0.26, 0.65)
Somewhat unimportant	0.69** (0.53, 0.90)	0.66** (0.49, 0.89)
Somewhat important (Ref)	1.00	1.00
Very important	1.56** (1.16, 2.10)	1.81** (1.35, 2.45)
Missing, not applicable, don't know	0.79 (0.30, 2.07)	1.80 (0.64, 5.04)
Clinical knowledge of HIV		
None or limited knowledge	0.98 (0.72, 1.33)	1.00 (0.71, 1.40)
Moderate knowledge (Ref)	1.00	1.00
Good knowledge	1.01 (0.78, 1.29)	1.18 (0.90, 1.54)
Excellent knowledge	0.96 (0.58, 1.58)	1.25 (0.74, 2.13)
Missing, not applicable, don't know	0.52 (0.13, 2.12)	2.30 (0.54, 9.73)
Training received in HIV testing and counseling		
None (Ref)	1.00	1.00
< 1 h	1.00 (0.73, 1.37)	0.98 (0.70, 1.38)
1–4 h	1.28 (0.88, 1.87)	1.59* (1.08, 2.36)
5–8 h	0.67 (0.36, 1.26)	0.92 (0.47, 1.81)
> 8 h	1.92 (0.98, 3.77)	1.78 (0.91, 3.49)
Missing, not applicable, don't know	0.61 (0.23, 1.62)	0.95 (0.32, 2.79)
Demographic characteristics		
Age	1.00 (0.99, 1.01)	1.01* (1.00, 1.03)
Male	0.83 (0.64, 1.09)	0.83 (0.62, 1.10)
Non-Hispanic White (Ref)	1.00	1.00
African American	1.31 (0.77, 2.23)	2.18** (1.24, 3.81)
Hispanic	1.02 (0.62, 1.67)	1.15 (0.69, 1.92)
Asian American	0.96 (0.69, 1.34)	0.96 (0.68, 1.37)
Other race	1.28 (0.81, 2.04)	1.28 (0.79, 2.06)
Required \$100 incentive payment	0.72* (0.55, 0.94)	0.91 (0.68, 1.22)
American Dental Association membership	1.18 (0.93, 1.50)	0.85 (0.66, 1.09)
Received Medicaid reimbursement	0.98 (0.76, 1.26)	1.01 (0.77, 1.33)
Had treated HIV patients within 5 y	1.04 (0.82, 1.31)	0.91 (0.70, 1.17)
Had recommended an HIV test to a patient	1.33 (0.99, 1.79)	1.52** (1.12, 2.06)
Reported familiarity with 2006 CDC recommendations	1.04 (0.75, 1.44)	1.67** (1.18, 2.38)
If they were to offer testing, would be concerned about negative reactions from their patients		
Strongly disagree	2.34* (1.14, 4.84)	2.12* (1.02, 4.40)
Disagree	1.37* (1.06, 1.76)	2.23** (1.72, 2.89)
Agree (Ref)	1.00	1.00
Strongly agree	0.63** (0.44, 0.89)	0.56** (0.37, 0.86)
Missing, not applicable, don't know	0.37* (0.15, 0.92)	0.45 (0.16, 1.29)
If they were to offer testing, patients' perception of them would improve		
Strongly disagree	0.18** (0.071, 0.46)	0.06** (0.016, 0.25)
Disagree	0.44** (0.33, 0.59)	0.33** (0.24, 0.45)
Agree (Ref)	1.00	1.00
Strongly agree	1.11 (0.43, 2.88)	4.31** (1.46, 12.69)
Missing, not applicable, don't know	1.26 (0.47, 3.35)	0.79 (0.29, 2.13)

Continued

TABLE 3—Continued

If they were to offer testing, colleagues' perceptions of them would improve		
Strongly disagree	0.80 (0.39, 1.63)	1.26 (0.54, 2.95)
Disagree (Ref)	1.00	1.00
Agree	1.57** (1.16, 2.12)	1.93** (1.42, 2.62)
Strongly agree	1.58 (0.60, 4.17)	1.85 (0.66, 5.17)
Missing, not applicable, don't know	0.61 (0.24, 1.52)	0.69 (0.26, 1.82)
Practice settings		
Solo private practice	1.18 (0.74, 1.87)	0.80 (0.48, 1.33)
Group private practice	1.23 (0.76, 1.99)	0.67 (0.40, 1.13)
Strata		
Ryan White EMA ^a (Ref)	1.00	1.00
Non-Ryan White EMA ^a (A)	1.03 (0.74, 1.44)	1.02 (0.71, 1.48)
Non-Ryan White EMA ^a (B)	1.07 (0.69, 1.68)	0.69 (0.41, 1.15)
Non-Ryan White EMA ^a (C)	1.06 (0.68, 1.66)	0.89 (0.54, 1.46)
Public health dentistry stratum	1.17 (0.78, 1.75)	0.74 (0.49, 1.14)

Note. CI = confidence interval; EMA = eligible metropolitan area; OR = odds ratio. Because of missing data, we used 1777 observations in our multivariate statistical analysis.

^aThe referent denotes Ryan White EMAs. Non-Ryan White EMA (A) denotes metropolitan areas that are not EMAs. Non-Ryan White EMA (B) denotes micropolitan areas, and Non-Ryan White EMA (C) denotes rural areas. (Ryan White CARE Act, Pub L No. 101-381, 104 Stat. 576, enacted August 18, 1990.)

* $P < .05$; ** $P < .01$.

less of an incentive. In bivariate comparisons, dentists requiring higher incentive payments were 9 percentage points less willing to provide rapid oral HIV screening.

Finally, the amount of training dentists received in HIV testing and counseling appeared to be associated both with willingness to provide and acceptance of HIV testing as part their professional role. Dentists with more than 8 hours of training had almost twice the odds of being willing to provide testing (OR = 1.92; CI = 0.98, 3.77) and to embrace testing as part of the dental role (OR = 1.78; CI = 0.91, 3.49).

DISCUSSION

We report the findings of the first nationally representative survey of dentists that examined their knowledge, attitudes, beliefs, and willingness regarding offering routine oral HIV rapid testing in the dental care setting. Our high response rate (70.7%) allows an especially complete description of the preferences and beliefs of the dental workforce. Our findings underscore the importance of survey designs that yield high response rates. Indeed, we found differential response rates among dentists with different attitudes toward our main dependent variables. Dentists who were most reluctant to respond (as evidenced by the need for more follow-up

calls or letters along with a higher incentive payment) were significantly less willing to provide rapid oral HIV screening. Low-response-rate methodologies can easily overrepresent the views of dentists with the most positive views regarding HIV screening, who may also be most enthusiastic about completing related surveys.

Attitudes Toward HIV Testing and Knowledge of Guidelines

Rapid oral HIV testing is potentially an important and valuable extension of the traditional dental role. Sixty percent of surveyed dentists indicated at least some willingness to offer such screening to their patients. Forty percent stated that HIV testing should be part of the dental professional role.

Yet our descriptive and multivariate findings underscore multiple obstacles to broad implementation. Given a disease that disproportionately affects minority communities, it is perhaps unsurprising that non-White dentists professed a greater willingness (although the difference was statistically nonsignificant) to screen in our bivariate analysis, and African American dentists had more than twice the odds of accepting this as part of their professional role. These respondents may be more familiar with individuals affected by HIV in their

own communities and in their professional practices.

We were surprised that, in our multivariable analysis, the odds ratio for professional role acceptance was greater than 1 for increasing age. Younger dentists appeared slightly less likely to support the provision of rapid oral testing as part of the dental role. In principle, this is the group most likely to experience the frontiers of current knowledge in their clinical training. It is possible that the topic of HIV testing has yet to be fully integrated into dental school curricula. It is also possible that older dentists have had greater exposure to individuals suffering HIV-related morbidities, which, in turn, may foster greater willingness to regard HIV population screening as part of the dental role.

Few dentists appeared to be familiar with the 2006 revised CDC HIV screening guidelines. These guidelines present the most prominent policy brief for widespread screening in relatively low-risk populations. These guidelines also underscore the potential importance of HIV screening in the dental setting. Dentists who were familiar with the 2006 CDC guidelines were more likely to see HIV screening as part of the dental professional role, although familiarity with these guidelines was not associated with increased willingness to offer such testing.

Normative Influences

Especially concerning were respondents' predictions of their colleagues' views of dentists who chose to offer HIV testing services. Fully 58.5% of respondents disagreed with the statement, "If I offered HIV screening, my colleagues' perception of me as a health care provider would improve." As noted, this response was strongly associated with decreased willingness to screen.

Most dentists (67.1%) also expressed concern regarding patients' acceptance of such population screening. Dental providers have previously identified low patient acceptance as a potential barrier to incorporating HIV screening in the dental setting.³² Dentists have also expressed concerns that offering HIV testing would be perceived as beyond the traditional role of the dental practitioner.³²

Although this study does not directly address patients' attitudes, patient surveys, including those carried out by members of this research team,^{17,22,29-31} suggest that dentists may overestimate patients' reluctance in this area. Continued research concerning patients' attitudes would be useful for identifying the determinants of patients' acceptance of such services.

Increasing HIV Screening in the Dental Setting

The survey results provide several findings that may be helpful in targeting public and professional information campaigns to increase screening. Public service announcements aimed at dentists, as well as those directed to the general population, may be helpful. Fewer than 12% of respondents were aware of the 2006 revised CDC guidelines, even though these guidelines contain pertinent recommendations about screening in relatively low-risk populations in all health care settings. Although the dental setting provides a feasible environment for chronic disease screening, the American public has been poorly prepared for these possibilities. The resulting lack of public acceptance becomes a further barrier to dentists' willingness or ability to embrace these clinical approaches. Initiating pilot programs within receptive pockets of the dental profession may also help to change professional norms.

If screening is the path to early HIV detection, prevention, and treatment, the dental setting may prove to be an important venue in addressing the HIV epidemic. The dental care setting provides an access point for individuals who would otherwise lack opportunities for routine HIV screening. This study underscores a number of barriers that need to be addressed before the dental setting's full potential in promoting population health can be realized. ■

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Contributors

H. A. Pollack and M. Pereyra, the coinvestigators and primary statisticians of the study, provided statistical expertise, performed the analyses, and contributed to interpretation of findings and writing and editing of the article. C. L. Parish contributed to the writing and editing of the manuscript. S. Abel contributed the development of the survey instrument and editing of the article. S. Messinger and R. Singer provided statistical expertise and contributed to interpretation of findings and editing of the article. C. Kunzel, B. Greenberg, B. Gerbert, and M. Glick assisted the study team in developing and reviewing the survey instrument and editing the final article. L. R. Metsch, the principal investigator for the study, co-originated the study, oversaw the study's implementation, and contributed to writing and editing the article. All authors were involved in editing the article, and have seen and approved the final version.

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References

- Centers for Disease Control and Prevention. New HIV infections in the United States. 2012. Available at: <http://www.cdc.gov/nchstp/newsroom/docs/2012/HIV-Infections-2007-2010.pdf>. Accessed January 15, 2013.
- Bozzette S. Routine screening for HIV infection—timely and cost-effective. *N Engl J Med*. 2005;352(6):620–621.
- Holmberg S, Palella F, Lichtenstein K, Havlir D. The case for earlier treatment of HIV infection. *Clin Infect Dis*. 2004;39(11):1699–1704.
- Thompson M, Aberg J, Hoy J, et al. Antiretroviral treatment of adult HIV infection: 2012 recommendations of the international antiviral society-USA panel. *JAMA*. 2012;308(4):387–402.
- Marks G, Crepaz N, Senterfitt J, Janssen R. Meta-analysis of high-risk sexual behavior in persons aware and unaware they are infected with HIV in the United States: implications for HIV prevention programs. *J Acquir Immune Defic Syndr*. 2005;39(4):446–453.
- Marks G, Crepaz N, Janssen R. Estimating sexual transmission of HIV from persons aware and unaware that they are infected with the virus in the USA. *AIDS (London)*. 2006;20(10):1447–1450.
- Cohen M, Chen Y, McCauley M, et al. Prevention of HIV-1 infection with early antiretroviral therapy. *N Engl J Med*. 2011;365(6):493–505.
- Office of National AIDS Policy. National HIV/AIDS strategy for the United States. 2010. Available at: <http://www.whitehouse.gov/sites/default/files/uploads/NHAS.pdf>. Accessed February 19, 2014.
- Branson BM, Handsfield HH, Lampe MA, et al. Revised recommendations for HIV testing of adults, adolescents, and pregnant women in health-care settings. *MMWR Recomm Rep*. 2006;55(RR-14):1–17.
- Patient Protection and Affordable Care Act of 2010, Pub L No. 111-148, §2702, 124 Stat 119, 318–319.
- US Preventive Services Task Force. USPSTF A and B recommendations. 2010, updated January 2013. Available at: <http://www.uspreventiveservicestaskforce.org/uspstf/uspstabrecs.htm>. Accessed January 15, 2012.
- US Preventive Services Task Force. Screening for HIV: draft recommendation statement. 2012. Available at: <http://www.uspreventiveservicestaskforce.org/uspstf13/hiv/hivdraftrec.htm>. Accessed February 19, 2014.
- Centers for Disease Control and Prevention. HIV prevalence estimates—United States, 2006. *MMWR Morb Mortal Wkly Rep*. 2008;57(39):1073–1076.
- Centers for Disease Control and Prevention. Diagnoses of HIV infection and AIDS in the United States and dependent areas, 2009. HIV Surveillance Supplemental Report, vol. 21. 2010. Available at: <http://www.cdc.gov/hiv/surveillance/resources/reports/2009report/index.htm>. Accessed July 31, 2013.
- Strauss S, Alfano M, Shelley D, Fulmer T. Identifying unaddressed systemic health conditions at dental visits:

- patients who visited dental practices but not general health care providers in 2008. *Am J Public Health*. 2012;102(2):253–255.
16. Glick M, Greenberg B. The potential role of dentists in identifying patients' risk of experiencing coronary heart disease events. *J Am Dent Assoc*. 2005;136(11):1541–1546.
 17. Dietz C, Ablah E, Reznik D, Robbins D. Patients' attitudes about rapid oral HIV screening in an urban, free dental clinic. *AIDS Patient Care STDS*. 2008;22(3):205–212.
 18. Hutchinson MK, VanDevanter N, Phelan J, et al. Feasibility of implementing rapid oral fluid HIV testing in an urban university dental clinic: a qualitative study. *BMC Oral Health*. 2012;12:11.
 19. Santella A, Krishnamachari B, Davide S, et al. Dental hygienists' knowledge of HIV, attitudes towards people with HIV and willingness to conduct rapid HIV testing. *Int J Dent Hyg*. 2013;11(4):287–292.
 20. Greenberg BL, Glick M, Frantsve-Hawley J, Kantor ML. Dentists' attitudes toward chairside screening for medical conditions. *J Am Dent Assoc*. 2010;141(1):52–62.
 21. Pollack HA, Metsch LR, Abel S. Dental examinations as an untapped opportunity to provide HIV testing for high-risk individuals. *Am J Public Health*. 2010;100(1):88–89.
 22. Greenberg BL, Kantor ML, Jiang SS, Glick M. Patients' attitudes toward screening for medical conditions in a dental setting. *J Public Health Dent*. 2012;72(1):28–35.
 23. Malamud D. Salivary diagnostics: the future is now. *J Am Dent*. 2006;137(3):284, 286.
 24. US Dept of Health Services. Oral health—healthy people. *Healthy People 2020*. 2012. Available at: <http://healthypeople.gov/2020/topicsobjectives2020/objectiveslist.aspx?topicid=32>. Accessed January 2013.
 25. Siegel K, Abel S, Pereyra M, Liguori T, Pollack H, Metsch L. Rapid HIV testing in dental practices. *Am J Public Health*. 2012;102(4):625–632.
 26. Lee Y, Wong D. Saliva: an emerging biofluid for early detection of diseases. *J Am Dent*. 2009;22(4):241–248.
 27. Vernillo AT, Caplan AL. Routine HIV testing in dental practice: can we cross the Rubicon? *J Dent Educ*. 2007;71(12):1534–1539.
 28. Pfaffe T, Cooper-White J, Beyerlein P, Kostner K, Punyadeera C. Diagnostic potential of saliva: current state and future applications. *Clin Chem*. 2011;57(5):675–687.
 29. VanDevanter N, Combellick J, Hutchinson M, Phelan J, Malamud D, Shelley D. A qualitative study of patients' attitudes toward HIV testing in the dental setting. *Nurs Res Pract*. 2012;2012(803169):1–6.
 30. Nassry D, Phelan J, Ghookasian M, et al. Patient and provider acceptance of oral HIV screening in a dental school setting. *J Dent Educ*. 2012;76(9):1150–1155.
 31. Blackstock OJ, King JR, Mason RD, Lee CC, Mannheimer SB. Evaluation of a rapid HIV testing initiative in an urban, hospital-based dental clinic. *AIDS Patient Care STDS*. 2010;24(12):781–785.
 32. Patton L, Santos V, McKaig R, Shugars D, Strauss R. Education in HIV risk screening, counseling, testing, and referral: survey of US dental schools. *J Dent Educ*. 2002;66(10):1169–1177.
 33. Chiodo G, Tolle S. Delivering bad news to dental patients. *Gen Dent*. 1997;45(3):228–230, 232, 234.
 34. Ajzen I, Fishbein M. *Understanding Attitudes and Predicting Social Behavior*. Englewood Cliffs, NJ: Prentice Hall; 1980.
 35. Fishbein M, Ajzen I. *Belief, Attitude, Intention and Behavior: An Introduction to Theory and Research*. Reading, MA: Addison-Wesley; 1975.
 36. D'Annunzio T, Pollack H. Changes in methadone treatment practices. Results from a national panel study, 1988–2000. *JAMA*. 2002;288(7):850–856.
 37. Dillman D. The design and administration of mail surveys. *Annu Rev Sociol*. 1991;17:225–249.
 38. Likert R. A technique for the measurement of attitudes. *Arch Psychol*. 1932;140:1–55.