hypogammaglobulinemia. J Allergy Clin Immunol **2010**; 126:120–6.
5. Kaiser L, Aubert JD, Pache JC, et al. Chronic rhinoviral infection in lung transplant recipients. Am J Respir Crit Care Med **2006**; 15:1392–9.
6. Flight WG, Bright-Thomas RJ, Tilston P, et al. Chronic rhinovirus infection in an adult with cystic fibrosis. J Clin Microbiol **2013**; 51:3893–6.
7. Becker TM, Durrani SR, Bochkov YA, Devries MK, Rajamanickam V, Jackson DJ. Effect of exogenous interferons on rhinovirus replication and airway inflammatory responses. Ann Allergy Asthma Immunol **2013**; 111:397–401.
8. Bellingan G, Maksimov M, Howell DC, et al. The effect of intravenous interferon-beta-1a (FP-1201) on lung CD73 expression and on acute respiratory distress syndrome mortality: an open-label study. Lancet Respir Dis **2014**; 2:98–107.
9. Ivashkiv LB, Donlin LT. Regulation of type I interferon responses. Nat Immunol **2014**; 14:36–49.
10. Falzarano D, de Wit E, Rasmussen AL, et al. Treatment with interferon-α2b and ribavirin improves outcome in MERS-CoV-infected rhesus macaques. Nat Med **2013**; 19:1313–7.

Correspondence: Olli Ruuskanen, MD, PhD, Department of Pediatrics, Turku University Hospital, 20520 Turku, Finland (olli.ruuskanen@tyks.fi).

Clinical Infectious Diseases 2014;58(12):1784–6

DOI: 10.1093/cid/ciu169

Intentions to Prescribe Preexposure Prophylaxis Are Associated With Self-efficacy and Normative Beliefs

To the Editor—We read with interest the article by Karris et al [1], which describes that although a majority of North American infectious disease physicians (74%) support the provision of human immunodeficiency virus (HIV) preexposure prophylaxis (PrEP) to at-risk individuals, strikingly few (9%) had prescribed PrEP. However, there remains a paucity of data regarding the views of primary care providers, who are best poised to prescribe PrEP to at-risk, HIV-negative patients. We conducted an online survey in December 2012 to understand factors associated with intentions to prescribe PrEP among physicians in the United States. Using a model based on the theory of planned behavior, we hypothesized that physicians' intentions to prescribe PrEP are driven by attitudes, self-efficacy, and normative beliefs [2–4].

Attitudinal questions assessed beliefs regarding PrEP-related safety, efficacy, adherence, antiretroviral resistance, risk compensation, and malpractice and insurance coverage. Self-efficacy questions evaluated physicians' confidence in identifying at-risk patients, prescribing PrEP, and monitoring patients based on the current guidance from the Centers for Disease Control and Prevention (CDC) [5, 6]. Normative beliefs were assessed by perceived peer approval of PrEP prescribing. There was good internal consistency in each domain (Cronbach $\alpha > .70$), and composite domain scores were divided into quartiles for analysis.

Intentions to prescribe PrEP were assessed with the question, "In the next year, how likely are you to prescribe PrEP to the following patients?" asked for 3 populations: men who have sex with men (MSM), at-risk women, and HIV-uninfected patients in serodiscordant relationships. We compared those who responded "very likely" with those who responded "somewhat likely" or "not likely at all" to best characterize early adopters of PrEP prescribing [4].

Email messages with a link to the survey (Supplementary Figure 1) were sent to 5672 physicians in 13 metropolitan areas with the highest HIV incidence selected from the American Medical Association Physician Masterfile, with up to 3 reminder requests over 4 weeks. Of 1545 physicians who opened at least 1 invitation email, 212 clicked on the survey link, 37 were ineligible (not involved in direct patient care or a related specialty), and 146 completed the survey (cooperation rate of 9.7%) [7]. Those who clicked on the survey link were more likely to be <50 years old (62% vs 48%; $P < .001$) and infectious disease physicians (14% vs 3%; $P < .001$).

The majority of respondents were primary care providers (84%) and in private practice (59%). The sample included physicians who practiced family medicine (34%), internal medicine (38%), obstetrics/gynecology (14%), and infectious disease (14%). The average patient population was 57% female, 12% MSM, 2% HIV-infected, and 1% in an HIV-serodiscordant relationship. Most providers had heard of PrEP (86%), nearly half (47%) were aware of CDC guidance on PrEP, and 21% had cared for a patient prescribed PrEP.

Overall, 28% of physicians reported that they would be willing to prescribe PrEP to MSM, 30% to at-risk women, and 45% to HIV-negative patients in serodiscordant relationships in the next year. We used multiple logistic regression to estimate intentions to prescribe PrEP based on domain quartile score, adjusting for significant covariates ($P < .05$) from univariate analyses (having cared for a patient on PrEP or postexposure prophylaxis). Self-efficacy and normative belief scores in the highest quartile were independently associated with intentions to prescribe PrEP, whereas attitudes and other covariates were not (Table 1).

Given the multiple barriers identified by Karris et al [1], our study provides insights that could guide the development of evidence-based interventions to increase PrEP prescribing. Our data support interventions that increase clinician self-efficacy (ie, online risk calculators or adherence monitoring tools) and influence normative beliefs (ie, comprehensive guidelines or endorsement from medical societies). We concur with the conclusion by Karris et al that the success of real-world PrEP will likely require a multifaceted approach [1].

Supplementary Data

Supplementary materials are available at *Clinical Infectious Diseases* online (http://cid.oxford

Table 1. Adjusted[a] Odds Ratios and 95% Confidence Intervals Estimating Intentions to Prescribe Preexposure Prophylaxis to At-Risk Patients Based on Self-efficacy, Attitudes, and Normative Beliefs Quartile Score[b]

	Intentions to Prescribe PrEP[c]								
	At-Risk Female Patients			MSM Patients			HIV-Uninfected Patient in Serodiscordant Relationship		
Variable	OR	95% CI	*P* Value	OR	95% CI	*P* Value	OR	95% CI	*P* Value
Self-efficacy score									
Q4	3.39	(1.21, 9.52)	.02	4.08	(1.42, 11.70)	.009	3.25	(1.26, 8.39)	.015
Q3	1.74	(.62, 4.85)	.294	2.62	(.94, 7.34)	.066	1.9	(.78, 4.64)	.156
Q2	1.66	(.51, 5.34)	.40	0.95	(.35, 3.63)	.937	1.45	(.52, 4.04)	.476
Q1	Ref	. . .		Ref	. . .		Ref	. . .	
Attitudes score									
Q4	0.98	(.37, 2.60)	.971	0.81	(.30, 2.17)	.67	0.85	(.36, 2.01)	.719
Q3	1.79	(.48, 6.77)	.389	1.12	(.29, 4.40)	.869	0.98	(.27, 2.51)	.976
Q2	0.9	(.35, 2.32)	.826	0.87	(.34, 2.21)	.766	0.55	(.23, 1.31)	.177
Q1	Ref	. . .		Ref	. . .		Ref	. . .	
Normative beliefs score									
Q4	6.58	(2.09, 20.75)	.001	4.83	(1.60, 14.58)	.051	5.51	(1.80, 16.82)	.003
Q3	4.33	(1.56, 12.04)	.005	2.12	(.88, 6.33)	.088	4.19	(1.65, 10.63)	.003
Q2	1.89	(.64, 5.64)	.252	0.75	(.22, 2.29)	.568	1.45	(.58, 3.65)	.426
Q1	Ref	. . .		Ref	. . .		Ref	. . .	

Abbreviations: CI, confidence interval; HIV, human immunodeficiency virus; MSM, men who have sex with men; OR, odds ratio; PrEP, preexposure prophylaxis.

[a] Adjusted model includes having cared for a patient on PrEP or postexposure prophylaxis (these variables were not significant in the final model).

[b] Higher quartile indicates more favorable views toward PrEP prescribing.

[c] Dichotomized as those reporting that they are "very likely" to prescribe vs "somewhat likely" or "not likely" to prescribe in the next year.

journals.org). Supplementary materials consist of data provided by the author that are published to benefit the reader. The posted materials are not copyedited. The contents of all supplementary data are the sole responsibility of the authors. Questions or messages regarding errors should be addressed to the author.

Notes

Acknowledgements. We thank Litjen Tan, PhD, Magdalena Sobieszczyk, MD, and Jennifer Briscoe for assisting in the survey design; Eric Vittinghoff, PhD, for assisting in the data analysis, and Nancy Hessol, MSPH, for assisting in the manuscript preparation.

Financial support. This study was funded by the AMA Foundation Seed Grant Research Program and Ruth Kirschstein National Research Service Award (5T32 MH019105–25) and by the National Institutes of Mental Health of the US Public Health Service (T32 MH19105).

Potential conflicts of interest. All authors: No reported conflicts.

All authors have submitted the ICMJE Form for Disclosure of Potential Conflicts of Interest. Conflicts that the editors consider relevant to the content of the manuscript have been disclosed.

Darpun D. Sachdev,[1,2] Kristefer Stojanovski,[1] Albert Y. Liu,[1] Susan P. Buchbinder,[1] and Grace E. Macalino[3]

[1]Bridge HIV, San Francisco Department of Public Health, California; [2]Center for AIDS Prevention Studies, University of California, San Francisco; and [3]Infectious Disease Clinical Research Program, Department of Preventive Medicine and Biometrics, Uniformed Services University of the Health Sciences, Bethesda, Maryland

References

1. Karris MY, Beekmann SE, Mehta SR, Anderson CM, Polgreen PM. Are we prepped for preexposure prophylaxis (PrEP)? Provider opinions on the real-world use of PrEP in the United States and Canada. Clin Infect Dis **2014**; 58:704–12.
2. Ajzen I. The theory of planned behavior. Available at: http://people.umass.edu/aizen/tpb.html. Accessed 5 March 2014.
3. Macalino GE, Sachdev DD, Rich JD, et al. A national physician survey on prescribing syringes as an HIV prevention measure. Subst Abuse Treat Prev Policy **2009**; 4:13.
4. Rogers E. Diffusion of innovations. 5th ed. New York: Free Press, **2003**.
5. Centers for Disease Control and Prevention. Interim guidance for clinicians considering the use of preexposure prophylaxis for the prevention of HIV infection in heterosexually active adults. MMWR Morb Mortal Wkly Rep **2012**; 61:586–9.
6. Centers for Disease Control and Prevention. Interim guidance: preexposure prophylaxis for the prevention of HIV infection in men who have sex with men. MMWR Morb Mortal Wkly Rep **2011**; 60:65–8.
7. American Association for Public Opinion Research. Standard definitions: final dispositions of case codes and outcome rates for surveys. Available at: http://www.aapor.org/Content/aapor/AdvocacyandInitiatives/StandardsandEthics/StandardDefinitions/StandardDefinitions2011.pdf. Accessed 5 March 2014.

Correspondence: Darpun D. Sachdev, MD, Bridge HIV, San Francisco Department of Public Health, 25 Van Ness Ave, Ste 100, San Francisco, CA 94102 (darpun.sachdev@sfdph.org).

Clinical Infectious Diseases 2014;58(12):1786–7

DOI: 10.1093/cid/ciu229