

# Psychiatrists' attitudes, knowledge, and experience regarding genetics: a preliminary study

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**Purpose:** This study is the first survey of a random national sample of US psychiatrists to assess attitudes, knowledge, and clinical experience regarding genetics. We hypothesized that clinicians with more recent genetics training would demonstrate more positive attitudes and greater genetics knowledge and experience than those with less recent training. **Methods:** A probability sample of US psychiatrists ( $n = 93$ ) was invited to participate in a mail survey regarding genetic medicine. **Results:** Forty-five psychiatrists completed the survey (response rate = 48%). All believed that genetics strongly or moderately influenced a person's mental health. Respondents expressed positive attitudes toward incorporating genetics into psychiatric practice, but most did not have recent genetics training or experience in referring patients to genetic counselors or ordering genetic tests. Psychiatrists who had genetics training within the previous 5 years had more experience in providing genetic services. **Conclusions:** This survey identified areas of strength (positive attitudes about providing genetic services, belief in the heritability of mental illness) and future targets for educational intervention (general genetics, information about testing and counseling resources). The association between recent training and a greater level of clinical genetics experience suggests that educational efforts may be successful in preparing psychiatrists to provide genetic services in the future. *Genet Med* 2008;10(6):439–449.

**Key Words:** genetics, psychiatry, survey, attitudes, medical education

Mental illnesses are among the most disabling conditions of humankind, causing the suffering of hundreds of millions of patients and families across the world. Psychiatric genetic research represents a bright hope for reducing this suffering by improving scientific understanding of the pathophysiology of mental disorders, creating new opportunities for rationally based treatments.<sup>1–6</sup> In addition, empirical data suggest that people living with mental illness and their families are eager for genetic research findings to be quickly translated into clinical genetic services. Surveys of these stakeholders have consistently demonstrated high levels of interest in genetic counseling and genetic testing for variants associated with mental illness.<sup>7–14</sup> Genetic tests are currently available for certain rare highly penetrant disorders with psychiatric manifestations, and recurrence risks can be estimated for persons with a family history of common mental illnesses such as schizophrenia, major depression, and bipolar disorder. As research findings of

susceptibility variants for common mental illnesses have begun to be replicated in independent samples,<sup>6</sup> it has become increasingly important to consider whether and how these discoveries should be translated into patient care.<sup>15–17</sup>

Genetic counselors and medical geneticists have traditionally been the health care providers who bring genetic research advances to the clinic, but the number of these professionals is predicted to be too small to handle the future demand for services from the many millions of people at risk for complex inheritance disorders such as common mental illnesses.<sup>18</sup> It is therefore expected that psychiatrists increasingly will be called upon to provide genetic counseling and testing to patients and their family members.<sup>15–17</sup> This will be an almost entirely new role for psychiatrists, who typically receive little or no instruction in clinical genetics during their postgraduate training.<sup>15</sup>

As of 2008, there had been few systematic attempts to learn whether psychiatrists are willing to take on this role, and if so, whether they have the necessary education and experience to do so. Among the existing psychiatrist surveys on the topic of genetic medicine,<sup>7,10,19–22</sup> many have assessed psychiatrists' knowledge of genetics through exam-style questions, and they have found it to be poor. Because these studies have typically used convenience or other nonprobability samples, whether their findings are generalizable is unknown. To our knowledge, no recent assessment of psychiatrists' preparedness to offer

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genetic counseling and testing has been undertaken using sampling techniques with the potential for generalizability.

The current preliminary study was created to address this gap in our knowledge by polling a random national sample of psychiatrists regarding their genetics education, attitudes toward providing genetic services, knowledge of clinical genetics resources and of the heritability of conditions and traits, and experience in providing three types of genetic services: genetic counseling to patients and families, referrals to genetic counselors, and genetic testing. We hypothesized that more recent genetics training would be associated with a greater preparedness to provide genetic services.

## MATERIALS AND METHODS

This observational study was a self-administered survey mailed to a probability sample of US psychiatrists in 2006. The survey protocol conforms to institutional requirements for human-subjects research, and was approved by the University of Chicago Social Sciences Division institutional review board.

### Sample

The sample consisted of 100 psychiatrists whose names and addresses were randomly drawn from the American Medical Association (AMA) masterfile. The AMA masterfile contains demographic data on almost every physician practicing in the United States (not limited to AMA members) and is considered a comprehensive and unbiased source.<sup>23</sup> All MDs and more than 93% of DOs practicing in the United States are included.<sup>24</sup> Data in the AMA masterfile are compiled, updated, and verified through weekly surveys of medical schools, residency training institutions, state licensing agencies, the US Drug Enforcement Agency, the National Board of Medical Examiners, and other regulatory bodies.<sup>25</sup>

To increase response rates to the survey, up to three questionnaires were mailed to each potential respondent at 3- to 4-week intervals. The third mailing included a 2-dollar bill as a token compensation. Of the 100 surveys mailed, seven were returned as undeliverable or because the physician had retired from practice. Of the remaining 93 potential respondents, 45 completed and returned the questionnaire, yielding a response rate of 48%. There were no significant differences between respondents and nonrespondents for all demographic variables that could be assessed (Table 1). In both groups 29% were women ( $P < 0.96$ ). Respondents' mean age was 52 (SD = 11) and nonrespondents' was 54 (SD = 13) ( $P < 0.46$ ). Sixty-nine percent of the respondents and 63% of the nonrespondents were board certified ( $P < 0.52$ ). Seventy-one percent of respondents and 73% of nonrespondents were graduates of US medical schools ( $P < 0.85$ ).

### Measures

The survey instrument was a 94-item self-administered questionnaire consisting of questions regarding genetic medicine. Here, we report the survey items concerning psychiatrists' preparedness to provide genetic services. For the pur-

**Table 1**  
Characteristics of psychiatrist respondents ( $N = 45$ ) and nonrespondents ( $N = 48$ )

	Respondents		Nonrespondents	
	<i>f</i>	%	<i>f</i>	%
Gender				
Women	13	29	14	29
Men	32	71	34	71
Mean age in years (SD)	52	(11)	54	(13)
Board certified	31	69	30	63
Location of medical training				
United States	32	71	35	73
Foreign	13	29	13	27
Ethnicity				
White, not Hispanic	30	67		
Asian	5	11		
Hispanic	2	4		
Not reported	8	18		
How do you spend the majority of your professional time?				
Outpatient psychopharmacology	26	58		
Hospital or inpatient psychiatry	6	13		
Other or multiple responses	13	29		
Have you had any of the following types of education in genetics?				
Undergraduate course	31	69		
Graduate genetics course	15	33		
Medical school course	37	82		
Residency course	11	24		
Fellowship course	4	9		
CME course	20	44		
Grand rounds	27	60		
How long ago was your most recent training in genetics?				
Within the last 2 yrs	10	22		
3–5 yrs ago	8	18		
6–10 yrs ago	6	13		
11–20 yrs ago	5	11		
More than 20 yrs ago	11	24		
No genetics training	5	11		

poses of this survey, physician "preparedness" includes the following domains: educational background, attitudes toward becoming a provider of genetic services; knowledge of the heritability of disorders and traits and of clinical genetics resources;

and experience with providing clinical genetics services, including family-history taking, genetic counseling, and genetic testing. Survey questions and response choices are reproduced verbatim in Tables 1–6. Survey responses regarding the future use of genetic testing in psychiatry and appropriate patient safeguards have been reported elsewhere.<sup>26</sup>

The instrument was based in part on previously administered questionnaires,<sup>21,27</sup> but was modified to exclude questions that directly tested respondents' factual knowledge about genetics. These questions were presumed to increase the cognitive burden of the survey and to potentially increase the non-response rate, particularly among clinicians with less knowledge of genetics. The survey was pretested with clinical psychiatrists and critically reviewed by experts in psychiatric genetics and experts in survey design at the University of Chicago. All mailings included a cover letter explaining that the survey was not a test of the participant's genetic knowledge and requesting participation by all clinicians, including those with little or no background or interest in genetics.

#### Data analysis

Categorical response frequencies are reported. Small differences in sample size arise from sporadic missing responses. Separate analyses were conducted with gender, age, board certification, and aspects of training as between-subject variables, and only the analysis using the timing of genetics training yielded any consistent or meaningful pattern of results. This variable was defined by respondents' answers to the survey question, "How long ago was your most recent training in genetics?" Conceptually related sets of rating scaled responses were subjected to within-subjects repeated measures multivariate analysis of variance. Differences in response patterns between subjects with and without recent training in genetics (genetics training within the last 5 years versus training more than 5 years ago or no training) were compared using  $\chi^2$  or Fisher exact tests.

## RESULTS

### Participant characteristics

Our 45 psychiatrist respondents were 29% women and 71% men. Ages ranged from 30 to 74 years, with mean age 52 years (SD = 11). Sixty-nine percent were board certified, 44% held an academic appointment (defined broadly to include adjunct appointments), and 71% were graduates of US medical schools. Women were younger than men (respective means = 44 vs. 56,  $P < 0.01$ ) and less likely to be board certified (46% vs. 78%,  $P < 0.04$ ). Thirty-six percent of responding psychiatrists treated children or adolescents routinely (Table 1).

### Genetics education and training

Sixty-nine percent of respondents had taken an undergraduate genetics course, and 33% had taken a graduate course. Most (82%) had a genetics course in medical school, 24% had a course in residency, and 9% had a course in fellowship. Nearly half of respondents (44%) had attended a continuing

medical education (CME) course in genetics, and 60% had attended a grand rounds lecture on the topic. Forty percent of psychiatrists reported that they had some type of training in genetics within the previous 5 years, 22% of them within the last 2 years, and 18% from 3 to 5 years ago. Of the remainder of the sample, 13% had training in genetics from 6 to 10 years ago, 11% from 11 to 20 years ago, 24% from more than 20 years ago, and 11% said they had not had genetics training. Those with genetics training within the past 5 years were significantly younger than the other respondents (mean age = 48 vs. 55,  $P < 0.04$ ), but the groups did not differ in gender composition, ethnicity, training location, board certification status, holding an academic appointment, or treating children or adolescents (Table 1).

### Perceptions of the influence of genetics on disorders, traits, and abilities

Psychiatrist respondents rated the influence of genetics (scaled from 1 = "none" to 2 = "weak" to 3 = "moderate" to 4 = "strong") on general mental health and on 10 psychiatric disorders; 8 traits, behaviors, and abilities; and 9 medical disorders. All respondents indicated that genetics or heredity has a strong or moderate influence on a person's overall mental health (64% and 36% of responses, respectively) (mean = 3.64; SD = 0.48). Participants believed that genetics has a strong influence on Huntington disease (mean = 3.90), moderately strong influence on alcoholism, bipolar disorder, schizophrenia, Alzheimer disease, attention-deficit hyperactivity disorder, and major depressive disorder (means = 3.24–3.54), and moderate influence on panic disorder, autism, and antisocial personality disorder (means = 2.62–2.86; Item main effect  $F(9,35) = 15.34$ ,  $P < 0.0001$ , maximum Cohen  $d = 2.0$ ) (Table 2).

In answers to questions about traits, behaviors, and abilities, respondents indicated that genetics has moderate influence on cognitive ability, athletic ability, and creativity (means = 2.95–3.22) and a weak to moderate influence on extroversion, aggressive behavior, risk-taking behavior, neuroticism, and conscientiousness (means = 2.40–2.75; Item main effect  $F(7,38) = 7.74$ ,  $P < 0.0001$ , maximum  $d = 1.19$ ). When asked about the influence of genetics on medical disorders, respondents indicated that genetics has moderate influence on which individuals develop cardiovascular disease, breast cancer, colon cancer, obesity, type II (noninsulin dependent) diabetes, asthma, and inflammatory bowel disease (means = 2.92–3.40) and weak to moderate influence on which individuals develop multiple sclerosis or lung cancer (means = 2.40–2.65; Item main effect  $F(8,36) = 8.60$ ,  $P < 0.0001$ , maximum  $d = 1.45$ ).

Respondents indicated that genetics has moderate influence on the set of psychiatric disorders (excluding Huntington disease to avoid skewing the results because it was the only condition listed with solely Mendelian inheritance) and on the set of medical disorders (means = 3.02–3.19) and smaller but still moderate influence on traits, behaviors, and abilities (mean = 2.79; Item main effect  $F(2,42) = 16.45$ ,  $P < 0.0001$ , maximum  $d = 0.89$ ).

**Table 2**  
Psychiatrists' estimates of the influence of genetics on disorders, behaviors, traits, and abilities

Item	Influence of genetics (% of responses)				Overall rating <sup>d</sup> Mean (SD)
	None	Weak	Moderate	Strong	
How much influence does genetics or heredity have on a person's mental health?	—	—	36	64	3.64 (0.48)
How much does genetics influence which individuals develop the following psychiatric disorders? ( <i>N</i> = 44) <sup>b</sup>					
Huntington disease	—	—	9	91	3.90 (0.28)
Alcoholism	—	2	41	57	3.54 (0.53)
Bipolar disorder	—	5	36	59	3.53 (0.54)
Schizophrenia	—	7	49	44	3.37 (0.56)
Alzheimer disease	—	7	56	38	3.30 (0.52)
Attention-deficit hyperactivity disorder	—	13	47	40	3.28 (0.61)
Major depressive disorder	—	11	53	36	3.24 (0.61)
Panic disorder	2	20	67	11	2.86 (0.62)
Autism	2	36	36	27	2.86 (0.51)
Antisocial personality disorder	4	44	36	16	2.62 (0.74)
How much does genetics influence the following traits, behaviors, or abilities? ( <i>N</i> = 45) <sup>c</sup>					
Cognitive ability	—	11	56	33	3.22 (0.64)
Athletic ability	—	18	58	24	3.07 (0.66)
Creativity	2	20	58	20	2.95 (0.68)
Extroversion	4	24	62	9	2.75 (0.67)
Aggressive behavior	2	38	49	11	2.68 (0.60)
Risk-taking behavior	7	27	60	7	2.66 (0.70)
Neuroticism	7	31	56	7	2.62 (0.71)
Conscientiousness	13	36	49	2	2.40 (0.75)
How much does genetics influence which individuals develop the following medical disorders? ( <i>N</i> = 44) <sup>d</sup>					
Cardiovascular disease	—	4	51	44	3.40 (0.57)
Breast cancer	—	11	44	44	3.33 (0.66)
Colon cancer	—	9	51	40	3.31 (0.63)
Obesity	4	4	60	31	3.18 (0.73)
Type II (noninsulin dependent) diabetes	2	16	64	18	2.98 (0.67)
Asthma	2	20	60	18	2.93 (0.70)
Inflammatory bowel disease	2	20	60	18	2.92 (0.65)
Multiple sclerosis	7	36	44	13	2.65 (0.77)
Lung cancer	7	49	40	4	2.40 (0.63)

(Continued)

### Attitudes and experiences regarding genetic counseling

About three-quarters of respondents (78%) considered psychiatrists to be the most appropriate professional to counsel psychiatric patients about the role of genetics in their disease, 13% identified a genetic counselor as the most appropriate provider, and 7% selected a medical geneticist for this role.

None considered counseling to be unnecessary. Almost all psychiatrists (95%) believed it was their role to discuss genetic information regarding psychiatric illness with patients and their families (Table 3). A majority (70%) of psychiatrists stated that they felt competent to do this, and 60% believed that their medical training had prepared them for the task.

**Table 2**  
Continued

Item	Influence of genetics (% of responses)				Overall rating <sup>a</sup> Mean (SD)
	None	Weak	Moderate	Strong	
Calculated means for the perceived influence of genetics upon the following: (N = 44) <sup>e</sup>					
Psychiatric disorders <sup>f</sup>					3.19 (0.44)
Traits, behaviors, and abilities <sup>g</sup>					2.79 (0.48)
Medical disorders <sup>h</sup>					3.02 (0.45)

<sup>a</sup>Scaled from 1 = "no influence" to 2 = "weak influence" to 3 = "moderate influence" to 4 = "strong influence."

<sup>b</sup>Overall rating from an item (within subjects) repeated measures MANOVA. Item  $P < 0.0001$ ; pooled SD = 0.64. Differences in overall means  $>0.24$  differ at  $P < 0.05$  by Fisher LSD.

<sup>c</sup>Overall rating from an item (within subjects) repeated measures MANOVA. Item  $P < 0.0001$ ; pooled SD = 0.69. Differences in overall means  $>0.24$  differ at  $P < 0.05$  by Fisher LSD.

<sup>d</sup>Overall rating from an item (within subjects) repeated measures MANOVA. Item  $P < 0.0001$ ; pooled SD = 0.69. Differences in overall means  $>0.28$  differ at  $P < 0.05$  by Fisher LSD.

<sup>e</sup>Overall rating from an item (within subjects) repeated measures MANOVA. Item  $P < 0.0001$ ; pooled SD = 0.45. Differences in overall means  $>0.15$  are significant at  $P < 0.05$  by Fisher LSD.

<sup>f</sup>Mean across all psychiatric disorders above except Huntington disorder (alcoholism, Alzheimer disease, antisocial personality disorder, attention-deficit hyperactivity disorder, autism, bipolar disorder, major depressive disorder, panic disorder, and schizophrenia).

<sup>g</sup>Mean across all behaviors and abilities above (aggressive behavior, athletic ability, cognitive ability, conscientiousness, creativity, extroversion, risk-taking behavior, and neuroticism).

<sup>h</sup>Mean across all medical disorders above (asthma, breast cancer, cardiovascular disease, colon cancer, inflammatory bowel disease, lung cancer, multiple sclerosis, obesity, and type II [noninsulin dependent] diabetes).

**Table 3**  
Psychiatrists' attitudes toward providing genetic services<sup>a</sup>

	f	%
You feel that it is your role to discuss genetic information regarding psychiatric illness with patients and their families (N = 44)		
Agree	42	95
Disagree	2	5
You feel competent to discuss genetic information regarding psychiatric illness with patients and their families (N = 44)		
Agree	31	70
Disagree	13	30
Your medical training has prepared you to discuss genetic information regarding psychiatric illness with patients and their families (N = 43)		
Agree	26	60
Disagree	17	40
You feel competent to offer genetic tests for psychiatric illness and interpret the results (N = 43)		
Agree	4	9
Disagree	39	91

<sup>a</sup>Variation in reported N is due to missing or incomplete responses.

Eighty-six percent of respondents reported that they routinely take detailed family histories of psychiatric illness during the evaluation of patients (Table 4). More respondents with training in genetics within the previous 5 years said that they routinely take family histories compared with those without such recent training (100% vs. 77%,  $P < 0.07$ , Fisher exact

test). More respondents with recent training in genetics than without it reported discussing the genetic component of psychiatric illness with all or most of their patients (89% vs. 64%,  $P < 0.09$ , Fisher exact test). A minority (23%) of psychiatrist respondents reported that telling a patient that there is a genetic component to his or her illness tends to make the patient less distressed about having a psychiatric illness; 5% reported that patients tend to be more distressed; and 53% reported that reactions vary among patients.

Psychiatrists were asked to indicate which of seven clinical scenarios represented situations in which they would provide genetic counseling themselves and in which they would refer patients to a genetic counselor, assuming that a trusted colleague who could provide affordable counseling was available (Table 5). Most respondents (72% and 70%, respectively) would personally counsel an individual with a family history of mental illness who wondered about his or her own risk of developing the disorder or a patient who wondered about the risk of passing on mental illness to his or her child. Half (50%) of respondents would refer to a genetic counselor in the case of a family with multiple family members affected with the same mental illness. Most (59–84%) would refer for genetic counseling a couple with a family history of mental illness and family planning questions, a patient with mental illness and mental retardation, or a patient with mental illness and multiple congenital anomalies. Significantly more respondents would refer to a genetic counselor in the last case than in the other six (84% vs. 21–61%, all  $P < 0.03$ , Fisher exact test), and significantly fewer respondents would refer to a genetic counselor in the first three cases than in the others (21–30% vs. 50–84%, all  $P < 0.09$ , Fisher exact test).

**Table 4**  
Psychiatrists' personal experience in counseling patients about genetics

	Trained in genetics within the previous 5 yrs				Overall	
	Yes		No		f	%
	f	%	f	%		
Do you routinely take detailed family histories of psychiatric illness during the evaluation of your patients? (N = 44) <sup>a</sup>						
Yes	18	100	20	77	38	86
No	0	0	6	23	6	14
How often do you discuss with patients the extent to which there is a genetic or hereditary component to the patient's psychiatric illness? (N = 43) <sup>b</sup>						
With all of my patients	7	39	4	16	11	26
With most of my patients	9	50	12	48	21	49
With some of my patients	2	11	7	28	9	21
With none of my patients	0	0	2	8	2	5
When you tell a patient that there is a genetic component to his or her illness, would you say this tends to make the patient: (N = 43)						
More distressed about having a psychiatric illness					2	5
Less distressed about having a psychiatric illness					10	23
Neither more nor less distressed about having a psychiatric illness					8	19
Varies among patients—have seen both reactions about equally					23	53

<sup>a</sup>Proportions differ by recency of training,  $P < 0.07$ , by Fisher exact test.

<sup>b</sup>Proportions for with all or most patients vs. with some or none differ by recency of training,  $P < 0.09$ , by Fisher exact test.

**Table 5**  
Psychiatrists' preferences regarding genetic counseling

	Address this yourself		Refer to a genetic counselor		N
	f	%	f	%	
	If you had a trusted colleague who could provide affordable genetic counseling to your patients, in which of the following situations would you refer to the colleague and in which would you address the issue yourself?				
A woman with questions about the safety of medication use during pregnancy	34	79	9	21	43
A person with a family history of mental illness who wonders about his/her own risk of developing the disorder	31	72	12	28	43
A patient who wonders about the risk of passing on mental illness to his or her child	30	70	13	30	43
A family with multiple family members affected with the same mental illness <sup>a</sup>	22	50	22	50	44
A couple with a family history of mental illness and family planning questions	18	41	26	59	44
A patient with mental illness and mental retardation	17	39	27	61	44
A patient with mental illness and multiple congenital anomalies <sup>b</sup>	7	16	36	84	43

<sup>a</sup>Response proportions differ from those of the items above, all  $P < 0.09$ , Fisher exact test.

<sup>b</sup>Response proportions differ from those of the items above, all  $P < 0.03$ , Fisher exact test.

The majority (88%) of psychiatrists, however, had not referred any patients for consultation regarding a genetic component of psychiatric illness during the past year (Table 6). Only 13% of respondents were aware of any professional, such as a medical geneticist or genetic counselor, providing genetic counseling to psychiatric patients in the geographic area where they practice. More than three-quarters of respondents (82%)

did not know whether most forms of insurance in their geographic area covered genetic counseling.

#### Attitudes and experience regarding genetic testing

Only 9% of respondents said they felt competent to offer genetic tests for psychiatric illness and to interpret the results (Table 3). Twenty-four percent of those who had been trained

**Table 6**Psychiatrists' experience and knowledge regarding genetic counseling referrals and genetic testing<sup>a</sup>

	<i>f</i>	%
Over the past year, how many patients have you referred for consultation regarding a genetic component of psychiatric illness in themselves or family members? ( <i>N</i> = 43)		
No patients	38	88
One or two patients	5	12
Three or more patients	0	—
During the past 5 yrs, have you ordered a genetic test for: (responses of yes from <i>N</i> = 42)		
Fragile X syndrome	6	14
Huntington disease	4	10
Alzheimer disease	2	5
Neurofibromatosis	1	2
Velocardiofacial syndrome	0	—
Any other genetic test	2	5
No tests ordered	33	79
Are you aware of any professional, such as a medical geneticist or genetic counselor, who provides genetic counseling to psychiatric patients in the geographic area where you practice? ( <i>N</i> = 45)		
Yes	6	13
No	39	87
Are you aware of any laboratories that provide genetic testing in the geographic area where you practice? ( <i>N</i> = 45)		
Yes	14	31
No	31	69
To your knowledge, is genetic counseling covered by most forms of insurance in the geographic area where you practice? ( <i>N</i> = 45)		
Yes	1	2
No	7	16
Do not know	37	82
To your knowledge, is genetic testing covered by most forms of insurance in the geographic area where you practice? ( <i>N</i> = 45)		
Yes	1	2
No	7	16
Do not know	37	82

<sup>a</sup>Variations in reported *N* are due to missing or incomplete responses.

in genetics in the past 5 years stated that they were competent to offer and interpret genetic tests, but none of those without recent training felt competent to do so ( $P < 0.02$ , Fisher exact test). Almost 80% of respondents had not ordered any genetic

tests during the past 5 years (Table 6). Tests for Fragile X syndrome were ordered by more respondents with than without recent training in genetics (28% vs. 4%,  $P < 0.07$ , Fisher exact test). Ordering tests for Alzheimer disease, neurofibromatosis, or some other condition was reported only by respondents with recent training in genetics.

Thirty-one percent of respondents were aware of laboratories providing genetic testing in the area in which they practiced (Table 6). More respondents who had genetics training within the previous 5 years were aware of laboratories that provide testing compared with those who had not had such recent training (56% vs. 15%,  $P < 0.01$ , Fisher exact test). More than three-fourths of respondents (82%) stated that they did not know whether most forms of insurance in their geographic area covered genetic testing and genetic counseling.

## DISCUSSION

To our knowledge, this preliminary study is the first to poll a random national sample of US psychiatrists on these issues, and it is the first to report an association between recent training in genetics and a greater experience in providing genetic services. The response rate for this study is similar to that achieved by other psychiatrist surveys on genetics, most of which have been limited by the use of sampling methods without the potential to yield generalizable data. Although our sample was small, it was sufficient to demonstrate that psychiatrists had strong beliefs in the influence of genetics on mental illness and positive attitudes toward providing genetic services and to support our hypothesis that psychiatrists with recent genetics training would be more prepared to offer services. These findings will be discussed in detail below.

### Perceptions of the influence of genetics on illnesses, traits, and abilities

As an indirect method of assessing respondents' genetics knowledge, we asked psychiatrists for their perceptions of the influence of genetics on conditions and traits. These survey items have ecological validity, because most respondents stated that they routinely talked to patients and families about the influence of genetics on mental illness. All 27 conditions and traits listed in the survey instrument are believed to have some genetic basis, though in many cases, heritability estimates are broad ranges that may be challenging to interpret in a meaningful way for individual patients.<sup>28</sup>

It is important not to over interpret our respondents' answers to these survey items, given the limitations of this type of assessment. However, a few general observations can be made. First, every psychiatrist in our sample believed that genetics played some role in the development of most of the psychiatric disorders listed. Furthermore, none of the psychiatrists gave answers that were consistently dismissive of the influence of genetic factors in psychiatric or medical diseases or in human traits, behaviors, and abilities—that is, no one chose “no influence” of genetics for all items within any of the three categories. Second, participants discriminated between individual disor-

ders, behaviors, and traits when estimating the influence of genetics, which is in accord with scientific evidence that heritability is not uniform within or between these categories.

It is also notable that the accuracy of our respondents' answers varied across conditions. More than 90% correctly identified Huntington disease, a Mendelian disorder with autosomal dominant inheritance, as a condition for which genetics has a strong influence. No psychiatrist selected "weak influence" or "no influence" on this question. On the other hand, for the question concerning autism—a complex inheritance disease whose published heritability estimates are  $>90\%$ <sup>29</sup>—nearly half of the respondents chose weak influence or no influence. This latter result is similar to the finding of the Finn et al.<sup>21</sup> survey of attendees at a CME psychopharmacology course in Boston, in which psychiatrists gave a median estimate of 10% when asked to estimate the heritability of autism.

Finally, it is of potential interest that our respondents' overall ratings of genetic influences on mental disorders was significantly greater than their ratings for medical disorders, and that both groups of illnesses were rated as being significantly more influenced by genetics than traits and abilities. Again, these data should not be over interpreted, because the conditions and traits selected for the questionnaire were not selected to be representative of the three general categories. Nevertheless, this observation may reflect psychiatrists' views about the relative heritability of various types of complex inheritance disorders and traits, which merits testing in a future study and comparison with other clinical and lay samples.

#### **Positive attitudes toward providing genetic services**

The psychiatrists in our sample demonstrated a positive attitude toward the incorporation of genetic services in the clinical practice of psychiatry. Almost all stated that providing genetic information to psychiatric patients and their families was appropriate to their clinical role, and most stated that psychiatrists were the most appropriate professional to provide genetic counseling to psychiatric patients. These findings were generally consistent with the results of the Finn et al.<sup>21</sup> study, in which 83% of the psychiatrists surveyed believed that providing genetic information to patients and families was important to their clinical role.

Interestingly, a much greater percentage of our sample felt competent (70%) and adequately trained (60%) to provide genetic information than was reported in the Finn et al. study (23% and 15%, respectively). This disparity may be the result of differing ascertainment methods, as our participants were recruited from a random sampling of US physicians, and the prior work's respondents were ascertained through attendance at a CME pharmacology course. Compared with US psychiatrists as a whole, clinicians attending the continuing education course may have been more likely to perceive themselves as somewhat deficient in competency or training, at least at that time and in that setting.

Another possibility is that the difference in results is due to an ordering effect of the items on the two questionnaires. In our questionnaire, items about self-perceived competency and

adequacy of genetics training appeared before questions asking respondents to estimate heritability, which were the only items that assessed genetics knowledge in any fashion. In the Finn survey, the relevant questions appeared at the end of the questionnaire, after several test-style psychiatric genetics questions and general genetics questions (CT Finn, Personal communication, 2008). Nearly 85% of respondents to the Finn survey answered fewer than half of the test-style questions correctly. Respondents' difficulty with these items may have affected their judgment of personal competency and adequacy of genetics training. Indeed, the authors reported a significant association between self-assessed competence and higher scores on the survey's measures of genetics knowledge.

It is important to note that psychiatrists' perceptions of their competence to offer genetic services are not necessarily an accurate reflection of their actual competence. Indeed, our finding that 35% of respondents had no genetics training within the previous 20 years calls into question the ability to provide precise and detailed information to patients and families about the heritability of illness. Furthermore, the current survey literature on this topic has clearly identified deficits in psychiatrists' genetic knowledge.<sup>19–22</sup>

Psychiatrists' actual genetics knowledge and competence is not simple to measure, however. Most psychiatrists' genetic surveys have used voluntary, self-administered written questionnaires, a type of instrument that most respondents complete very rapidly, expending as little time as possible on each question.<sup>30</sup> Busy physicians may not have the time or motivation to carefully work through genetics problems presented in a voluntary survey and instead may skip such items, answer "don't know," or choose the first response that seems reasonable. Psychiatrists' genetics knowledge may be more accurately measured by analyzing responses to genetics questions on tests that psychiatrists are motivated to perform well upon—for example, the psychiatry resident-in-training exam or the written examination for certification by the American Board of Psychiatry and Neurology. To our knowledge, no such data have been published.

#### **Clinical experience with genetic counseling and testing**

Many psychiatrists in this study reported some experience in providing genetic counseling for their patients. Most respondents routinely took family histories of psychiatric illness and talked to at least some patients about the role of genetics in their illness. However, few psychiatrists had made referrals to genetic counselors during the previous year, were aware of any genetic counselors in the area providing services to patients with psychiatric illness, or knew whether genetic counseling was covered by insurance. These results may be due to a lack of psychiatric genetic counseling services rather than, or in addition to, a lack of knowledge of existing resources.

When asked about clinical scenarios in which they might refer to a genetic counselor or counsel patients themselves, the psychiatrists demonstrated an ability to identify certain presentations suggestive of an underlying Mendelian disorder (a psychiatric patient with multiple congenital anomalies or

mental retardation) and a desire to refer such patients to genetic counselors. Overall, the psychiatrists' responses to this group of items were generally consistent with recommendations for primary care referral to genetic counseling that have been established by the American College of Medical Genetics.<sup>31</sup>

It is also interesting to note that most psychiatrists reported that counseling patients about genetic influences on their illness made some patients more distressed about having a mental illness and some patients less distressed, in about equal numbers. This observation is pertinent to a growing debate over how the "geneticization" of mental illness is likely to affect the social stigmatization of psychiatric disorders and patients' self-esteem. Some experts and patients believe that a genetic or other biological explanation for mental illness demonstrates that these diseases are as "real" as physical illnesses and that the patients should therefore not be blamed for their suffering.<sup>32</sup> An alternative view is that characterizing mental illnesses as genetic disorders saddles patients with an additional, stigmatizing label—that of being genetically defective, even "mutant."<sup>33</sup> To our knowledge, the current study is the first to provide empirical data on psychiatrists' perceptions of the psychological impact of genetic information on their patients. Our finding suggests that both sides of the debate may be correct: some individuals will find comfort in knowing that genetics is partially responsible for their mental disease, and others will be distressed by the same information. These results must be interpreted cautiously, however, as patients' emotional responses to information about the heritability of their disease could be influenced by many factors, such as the clinician's sensitivity, relationship with the patient, and factual understanding of psychiatric genetics.

Regarding genetic testing, the psychiatrists in our sample reported very limited clinical experience, and nearly all said they did not feel competent to offer genetic tests for psychiatric illnesses and interpret the results. These results were not unexpected, given the paucity of genetic tests currently available for psychiatric conditions,<sup>16,34</sup> and they suggest that our sample was not biased in favor of clinicians who provide an unusual amount of genetic services. This finding is also noteworthy because the lack of experience and self-assessed competence represents a potential barrier to the future provision of services.

#### **Association between recent genetics training and clinical experience**

Our hypothesis that more recent genetics training would be associated with greater preparedness was supported in part by the finding of an association between training and clinical genetics experience. We did not find differences in attitudes toward genetic medicine in the attitude items described here. Nor did we find any meaningful pattern of differences in psychiatrists' assessment of the influence of genetics on various conditions.

The discovery of an association between recent genetics training and clinical experience is noteworthy, because it suggests that targeting genetic education interventions at psychiatrists may translate into changes in practice. We found, for

example, that the recently genetics-trained respondents were more likely than other psychiatrists to say that they routinely took family health histories and discussed the genetic component of psychiatric illness with their patients. The size of these differences was moderate (100% vs. 77% and 89% vs. 64%), though not statistically significant. Significant differences were seen in the items concerning genetic testing. None of the respondents without recent genetics training stated that they were competent to offer and interpret genetic tests, in contrast to 24% of the recently trained psychiatrists. The recently trained psychiatrists were also significantly more likely to be aware of laboratories that provided genetic testing and were more likely to have ordered tests for Fragile X disorder. All of the respondents who reported having ordered tests for Alzheimer disease, neurofibromatosis, or "other" were in the recently trained group. The association between greater provision of genetic services and recent genetics training persisted even after controlling for other potentially confounding factors, such as board certification status, gender, age, and treating children and adolescents.

#### **Strengths and limitations**

The strengths of this study include the use of a probability sampling method to assess the readiness of psychiatrists to provide services in a clinical area that is integral to future psychiatric practice.<sup>16,17,34</sup> Limitations of this study include the use of a new instrument that relies on self-report data; the lack of a comparison group such as other health professionals, patients, or families; and the small sample size. The sample size limited our ability to perform subgroup analysis, though it was sufficient to detect some suggestive and significant differences associated with recent genetics training. Because our survey relied on self-report data, we have no independent corroboration of respondents' answers regarding their genetics training and their experience in providing clinical services.

In addition, although the response rate was acceptable and there were no differences between respondents and nonrespondents on all measurable demographic items, we cannot exclude the possibility of nonresponse bias because of differences in genetic knowledge and/or interest among respondents and nonrespondents. It should be noted that we employed several strategies to minimize this form of bias, including the exclusion of test-style genetics questions from the survey on the grounds that they might reduce the response rate in general and might particularly deter those with less interest or knowledge in genetics. Cover letters mailed with the surveys explained that genetics knowledge was not a prerequisite for participating in the survey, and that we were seeking the opinions of all psychiatrists, including those with little or no background or interest in genetics. Nevertheless, we were unable to contact nonrespondents to assess differences in attitudes and experiences between those who participated in the survey and those who did not. If nonresponse bias is a significant factor, we would expect it to skew our results toward more positive attitudes

regarding genetics and/or toward a greater degree of clinical experience in providing genetics counseling and testing.

### Directions for future research

Future studies with larger samples and including comparison groups such as genetic counselors, medical geneticists, and other clinicians are warranted, as are prospective studies of the results of educational interventions designed to help psychiatrists prepare for the genome era. The results of the current study provide some guidance about the content of future educational interventions. It seems that psychiatrists do not need to be persuaded that genetics is important to learn or that mental disorders are heritable, but they do need practical information about providing and referring to genetic services such as genetic counseling. When and if more genetic tests become clinically available, psychiatrists will need information about ordering those tests and interpreting their results.

Many other aspects of psychiatrists' "genetic readiness" remain to be explored empirically. For example, how ready are psychiatrists to answer patients' questions about emerging applications of genetics that may come to their attention through media reports, such as direct-to-consumer genetic testing or "personalized medicine"? How ready are psychiatrists to provide empirical risk information to patients and families? Individualized estimates of recurrence risk for complex inheritance psychiatric disorders, though challenging to compile,<sup>35–37</sup> may be highly valuable to consumers.<sup>17</sup>

Other promising areas for future research include detailed assessments of the adequacy of the numbers of psychiatrists, clinical geneticists, and genetic counselors to meet the projected future need for clinical psychiatric genetic services, and assessments of the genetics educational needs and preferences of child/adolescent psychiatrists and other psychiatric subspecialists. Finally, the ethical aspects of psychiatric genetics have generated a great deal of discussion,<sup>7,26,38–42</sup> but relatively little is known about how psychiatrists view this subject and about their educational needs regarding ethical and legal duties.

### CONCLUSION

This survey of a probability sample of US psychiatrists' readiness to offer genetics services has identified areas of strength among our respondents (positive attitudes about providing these services, belief in the heritability of mental illness) and potential targets for educational interventions (general genetics training, information about testing and counseling resources). Physicians' predisposition to pursue lifelong learning has been conceptualized to comprise several factors, including the motivation to learn and the ability to recognize one's own educational needs.<sup>43</sup> Most psychiatrists in our sample reported that understanding genetics was important to their professional role, and they recognized and acknowledged limitations in their current level of competence, particularly in regard to genetic testing. Furthermore, those who had more recent genetics training were more likely to provide the genetic services that are currently available. Thus, although these findings sug-

gest that US psychiatrists require additional genetics education to be prepared for the genome era, it also provides reason to be optimistic that such efforts may be both welcome and effective.

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