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Biobank Participants' Preferences for Disclosure of Genetic Research Results: Perspectives From the OurGenes, OurHealth, OurCommunity Project

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Abstract

Objective—To assess biobank participants' preferences for disclosure of genetic research results. **Patients and Methods:** We conducted a cross-sectional survey of participants in the OurGenes, OurHealth, OurCommunity biobank. Respondents were surveyed about preferences for disclosure, importance of disclosure, communication of results with practitioners, and sharing of results after respondents' death. Multivariate regression analysis was used to assess independent sociodemographic and clinical predictors of disclosure preferences. Data collection occurred from June 6, 2011, to June 25, 2012.

Results—Among 1154 biobank participants, 555 (48%) responded. Most thought that research result disclosure was important (90%). Preference for disclosure varied, depending on availability of disease treatment (90% vs. 64%, $P<.001$), high vs. low disease risk (79% vs. 66%, $P<.001$), and serious vs. mild disease (83% vs. 68%, $P<.001$). More than half of respondents (57%) preferred disclosure even when there is uncertainty about the results' meaning, and 87% preferred disclosure if the disease is highly heritable. Older age was positively associated with interest in disclosure, whereas female sex, nonwhite race, diabetes mellitus, and depression and/or anxiety were negatively associated with disclosure. More than half of respondents (52%) would want their results returned to their nearest biological relative after death.

Conclusions—OurGenes biobank participants report strong preferences for disclosure of research results, and most would designate a relative to receive results after death. Participant preferences for serious vs. mild disease, high vs. low disease risk, and availability of disease treatment differed significantly. Future research should consider family members' preferences for receiving research results from enrolled research participants.

The question of whether researchers have an ethical obligation to disclose genetic research results to participants in biobanks remains open and controversial. Because of rapid advances in genotyping technology, biobanks have the capacity to generate a substantial number of individual research results, many of which will have unknown significance.^{1,2} The fluid nature of biobanks and the pleiotropic nature of genes make disclosure to

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participants challenging.³⁻⁵ Furthermore, the estimated number of disease-associated variants that might meet the criteria for disclosure is expected to be between 11,000 and 15,000, so a well-designed infrastructure is critical to support disclosure.⁶ Despite challenges to disclosure, participants in genetic research studies have a preference for results, and disclosure may increase public willingness to participate in large genetic cohort studies.^{7,8}

Participants' preferences for disclosure are not reflected in current practice. Only approximately half of existing biobanks publicly describe their disclosure policies, and few disclose results to participants.^{9,10} There is limited policy guidance on this issue. Surveyed institutional review board (IRB) participants believed they would benefit from having regulations to follow or recommendations to interpret.¹¹ The Electronic Medical Records and Genomics Network's Return of Results Oversight Committee recommends disclosure only for clinically actionable findings (i.e., findings with potential to change immediate medical care).¹

Few studies have quantitatively assessed participants' preferences for disclosure in a large-scale genomic biobank.¹³ Focus groups conducted with prospective biobank participants and the public reveal that the nature of the research and type of research result affects participants' opinions about disclosure.^{14,15}

Disclosure of research results may affect the broader clinical and social context. Data from genome sequencing provides information that is relevant not only to the original participant, but also to the participant's biological family.¹⁶

Previous case studies indicate that it may be appropriate to return research results to a participant's family member after death but that such disclosure should not occur without the participant's prior consent.¹⁷⁻¹⁹ Participant preferences, clinical utility to the recipient, and the recipient's preferences to receive results should be evaluated before postmortem disclosure.¹⁷⁻¹⁹

There are currently few health care professionals with the expertise to readily interpret genetic findings.¹⁶ We need to understand participants' sharing preferences to develop an infrastructure for disclosure that facilitates responsible communication with participants.

We assessed biobank participants' preferences for disclosure of genetic research results and the sociodemographic and clinical predictors of disclosure preferences. Because limited quantitative research in this field exists to date, this was primarily an exploratory study. We hypothesized that (1) most biobank participants (>50%) would definitely or probably want disclosure of research results across all hypothetical scenarios,¹⁵ (2) demographic and clinical characteristics would affect disclosure preferences,²⁰ (3) most participants (>50%) would believe it is very or somewhat important to receive genetic research results,¹⁵ (4) few participants would want to share their research results with anyone outside the study,²⁰ and (5) most participants would want their genetic research results returned to their nearest biological relative after death. We studied these hypotheses in selected participants in the Brigham and Women's Hospital's (BWH) OurGenes, OurHealth, OurCommunity (OurGenes) project.

Materials and Methods

Study Group

Participants were selected from BWH's OurGenes biobank, which consists of patients recruited in the context of clinical care appointments since 2010. Participants consent to storage of blood, linkage of the sample with their BWH electronic medical record, and storage of a health information questionnaire that collects additional information about participants' health behaviors, lifestyle, and family history. Most participants (93%) also provide consent to be recontacted by the biobank for additional information or samples. All samples and information stored in the OurGenes biobank are accessible for broad use. A subpopulation of participants recruited to this study was invited to participate in a survey about their preferences for disclosure of genetic research results. Eligible participants were English-speaking OurGenes participants who agreed to recontact at initial consent. Data collection occurred from June 6, 2011, through June 24, 2012. The study was approved by the Partners HealthCare IRB.

Data Collection

Eligible participants were sent one request to complete a self-administered electronic or paper questionnaire. Electronic survey data were collected using Research Electronic Data Capture tools hosted at BWH. Research Electronic Data Capture is a secure, Web-based application designed to support data capture for research studies.²¹ The questionnaire addressed 4 questions around participants' desire to receive genetic research results: (1) importance of disclosure, (2) preferences for disclosure of genetic research results, (3) communication of results with practitioners, and (4) sharing genetic results after participants' death (Supplemental Appendix, available online at <http://www.mayoclinicproceedings.org>).

Preferences for disclosure were assessed through 8 hypothetical disease scenarios in which the penetrance, preventability, seriousness, heritability, and uncertainty of the mutation and disease varied. Participants were asked about disclosure preferences for highly heritable traits with a high risk of disease to assess preferences for disclosure of mutations that are 50% heritable (autosomal mutations) but where risk of disease is modified by nongenetic factors. A 50% chance of passing a genetic mutation on to offspring was perceived as high heritability. Sociodemographic, health behavior, and clinical data were captured from the OurGenes information repository.

Dependent Variables

Importance of Disclosure: Participants were asked to rate on a 5-item Likert scale the importance of receiving research results from participating in research.

Preferences for Disclosure of Genetic Research Results: Participants' desire for disclosure of research results that might predict different types of outcomes was measured in 8 hypothetical scenarios. The scenarios were constructed to broadly represent the nature of the potential outcome of the research result in question. No examples of mutations or associated

diseases were provided to minimize potential bias induced by social norms about particular diseases or personal family medical history.

Communication of Results With Practitioners: Participants could select professionals in the medical field with whom they would share research results. Brief definitions of each professional were listed next to the response option to standardize participants' knowledge about the health care professionals. The analysis was dichotomized to compare each response category against all others (excluding the other category).

Independent Variables

Independent variables included sociodemographic, health behavior, and clinical characteristics. Sociodemographic data were collected from the BWH electronic medical record. Health behavior and clinical data were obtained from the OurGenes supplementary questionnaire. Sociodemographic data included age, sex, race, educational level, and marital status. Age was used as a continuous variable after confirming linearity (cubic age and age-square terms were not significant; $P=.65$ and $.18$, respectively). Race was dichotomized as white vs. nonwhite to increase statistical power. A live alone variable was created as a dichotomous variable to represent a social support indicator. The live alone variable was created from the marital status variable by comparing participants who were married or lived with a partner to all other groups. Educational level was dichotomized as high school or less vs. college educated or higher because preliminary univariate analysis revealed that the participant preferences were similar for college educated and graduate school educated participants. Health behaviors included smoking status, alcohol intake, and exercise behaviors. Clinical data included body mass index (calculated as the weight in kilograms divided by the square of height in meters), hypertension, high cholesterol level, heart disease, type 2 diabetes mellitus, asthma, depression and/or anxiety, osteoarthritis, rheumatoid arthritis, osteoporosis, and cancer.

Statistical Analysis

Frequencies and means were used to describe respondent and nonrespondent characteristics. The χ^2 tests and Mantel-Haenszel tests were used to assess statistically significant differences between respondents and nonrespondents for categorical variables with more than 2 categories when appropriate. We calculated the percentages of respondents who rated importance of receiving their own genetic results in 5 categories. For presentation of disclosure preferences, the not sure, probably not, or definitely not responses were combined (Figure). To increase statistical power, we dichotomized the preferences for disclosure responses to definitely yes vs. all other responses in logistic regression models. We used the χ^2 test and Fisher exact test to assess the overall differences in categorical variables. The bivariate association between 2 continuous variables was assessed with Pearson product moment correlations. The general estimating equation (GEE) approach was used to assess whether participant responses to questions about high vs. low disease risk, availability of disease treatment, and severe vs. mild disease were different after accounting for within-participant correlation. Different covariance models were evaluated using quasi-likelihood information criterion.

Our primary outcomes were: (1) preferences for disclosure in different hypothetical scenarios and (2) choice of practitioner for communication of results. Our primary predictors were sociodemographic characteristics, health behaviors, and clinical comorbidities.

Using logistic regression, we calculated odds ratios (ORs) with 95% CIs for univariate associations among sociodemographic characteristics, health behaviors, clinical comorbidities, and outcomes. In multivariable analyses of preferences for disclosure, we adjusted for those predictors that were significant in the univariate analyses ($P < .05$), which included age, sex, race, educational level, living alone, depression and/or anxiety, and type 2 diabetes. In separate multivariate logistic regression models, one for each response category, for choice of practitioner for communication of results, we adjusted for only demographic predictors: age, sex, race, educational level, and living alone. In addition, we included result types by characteristic interactions in the model to evaluate whether associations differ according to the type of result.

Finally, we calculated the percentages of respondents who would want research results shared after their death with biological relatives or advanced designees or who would not wish to share research results. Two-tailed tests were used throughout, and $P < .05$ was considered statistically significant. Analyses were performed using SAS statistical software, version 9.2 (SAS Institute Inc).

Results

Description of the Study Population: We contacted 1154 biobank participants by e-mail or mail. The total number of respondents was 555 (224 responded via e-mail and 332 responded via mail), and the total response rate was 48.1%. No statistically significant differences were observed between the response rates of men and women: 186 of the 404 (46%) and 369 of the 750 (49%), respectively. No statistically significant differences were observed between the response rates of individuals with any of the 10 health conditions. However, significant differences were observed by age, race, educational level, living alone, smoking exposure, alcohol intake, and exercise behaviors. Older participants, white participants, graduate school graduates, those who live with someone, never smokers, alcohol users, and those who exercise 2 to 6 hours per week were more likely to complete the survey (Table 1).

Importance of Disclosure: Most participants thought it very (59%) or somewhat (31%) important to receive their genetic research results. Fewer participants said it was not very (6%) or not at all (3%) important, and a small number of participants were unsure (2%) about the importance of disclosure.

Preferences for Disclosure of Genetic Research Results: A definite preference for disclosure of genetic research results ranged from 57% to 90%, depending on what type of disease the mutation would confer and certainty of the mutation's effects (Figure). Preference for disclosure varied, depending on availability of disease treatment (90% vs. 64%, $P < .001$), high vs. low disease risk (79% vs. 66%, $P < .001$), and serious vs. mild disease (83% vs. 68%, $P < .001$). More than half of respondents (57%) preferred disclosure even when there is

uncertainty about meaning of results and 87% if the disease was highly heritable. After multivariate adjustment, age, sex, race, depression and/or anxiety, and type 2 diabetes were significant predictors of disclosure preference in a multiple logistic regression that treated preference for disclosure as a binary independent variable (Table 2). Older age was independently associated with preference for disclosure when there was a slightly increased risk of disease. Depression and/or anxiety and type 2 diabetes were inversely associated with disclosure preference if there is a greatly increased risk of disease. Compared with men, women were less interested in disclosure when (1) there was a slightly increased risk of disease, (2) there was uncertainty about the meaning of the research result, and (3) there was no effective treatment or prevention available. Compared with white respondents, nonwhite respondents were less interested in disclosure even when effective treatment is available (OR, 0.4; 95% CI, 0.19-0.86). In an analysis using GEE to assess whether there were result type x characteristic interactions, we found that the associations of most characteristics did not differ according to the type of result ($P=.61$ for sex x type, $.20$ for educational level x type, $.36$ for living alone x type). No significant interactions were found between diabetes x type for high risk of disease ($P=.08$), prevention or treatment available ($P=.052$), and serious disease ($P=.07$) and for depression and/or anxiety x high risk of disease ($P=.06$). The only significant interaction was for nonwhite race x prevention or treatment available ($P=.01$). The difference in preferences between white and nonwhite participants was greater in the prevention or treatment type of question than in other types ($P=.01$).

Communication of Results With Practitioners: Participants most often endorsed sharing their genetic research results with their primary care physician (71%) and/or specialist (64%), whereas only 42% and 37% of responders endorsed sharing research results with a genetic counselor and/or medical geneticist, respectively. In multivariate logistic regressions for choice of disclosure to each practitioner, some small but statistically significant differences were observed. Participants who were older were less likely to endorse talking to a primary care physician (OR, 0.98; 95% CI, 0.97-1.00). Women (OR, 0.58; 95% CI, 0.39-0.88) and nonwhite participants (OR, 0.51; 95% CI, 0.29-0.90) were less likely to endorse speaking with a specialist (Table 3).

Sharing Genetic Research Results After Participants' Death: More than half (52%) of participants would want their genetic results returned to a biological relative after their death. Thirty percent of participants would designate someone other than a biological relative to receive research results after their death, and only 9% of participants would not want their research results disclosed after their death.

Discussion

Our study supports previous research that participants want genetic research results.¹⁴ We found that preferences regarding disclosure of individual genetic research results vary on the basis of the type of research result. Most participants in our study wanted genetic research results disclosed across all the hypothetical scenarios. Even when no intervention was available, 64% definitely wanted results and 20% probably wanted results disclosed. Similarly, even when there was uncertainty about the meaning of the genetic result, 57% definitely wanted disclosure. We also found that sociodemographic and clinical factors

predict preferences. Women were less interested in disclosure when there was no effective treatment, when there was only a slightly increased risk of disease, and when there was uncertainty about the meaning of the results. Participants with a history of depression, anxiety, and diabetes were less interested in disclosure when there was a greatly increased risk of disease.

Biobanks are typically established to support future biomedical research and have been thought to have little direct benefit to the participants who contribute. Patients who join biobanking projects generally do so out of an altruistic desire to help future generations. We may, however, be able to achieve broader participation in biobanks if researchers are aware of and respect participants' preferences for disclosure of results. The ethical principle of respect for persons promotes respecting participants' self-determination and valuing their contribution to research.^{15,16}

Although studies have consistently supported participants' desire for disclosure, the research community has been slow to respond.^{1,15,22} Only approximately half of surveyed genetic researchers considered disclosure in the study design phase, and only 28% currently offer return of research results.^{13,23} Eighty-two percent of surveyed researchers believed that participants should determine whether incidental findings are returned, indicating that they are receptive to having participants guide disclosure policies.²⁴

Although the research community expresses openness to disclosure, there is a lack of consensus in practice about what should be disclosed and to whom.²⁵ Some researchers advocate returning research results that are clinically actionable.^{23,26} These recommendations align with our participants' definite preference for disclosure about conditions that are preventable or treatable. More research is needed to help biobanks develop and evaluate the appropriate infrastructure to support return of results.^{23,24} Until policy guidance is developed, consent forms should be written in a way that allows for the opportunity to return research results in the future.²⁷

Our study adds to existing literature by quantitatively presenting the perspective of participants from a US biobank. Despite preferences for disclosure, there are formidable barriers to disclosure, including lack of standard policy, increased legal liability, and increased costs associated with disclosure.^{26,28} Only a few potential biobank participants understand these logistical barriers to disclosing research results.¹⁴ The public believes that costs related to confirming genetic research results should be absorbed by the study budget.¹⁵ Engaging the public in policy decisions about disclosure is important to promoting a shared responsibility for managing logistical barriers.

Although participants in this project generally support disclosure, important variability emerged. Participants were most favorable toward receiving genetic research results when intervention or treatment was available and were less favorable if there was uncertainty about the research result. This is consistent with focus group findings.³ There is a small but important group of individuals who do not want disclosure even if intervention or treatment is available. Disclosure policies that respect participants' preferences should be developed. We suggest that investigators assess participants' preferences for disclosure during the

informed consent process. Participants generally join research for altruistic reasons and value their right to choose what they learn from research findings.^{29,30}

In our multivariable analysis, sociodemographic and clinical characteristics predict participant preferences. Age, sex, race, depression and/or anxiety, and type 2 diabetes were statistically significant predictors of participant disclosure preferences for results when effective treatment is or is not available, there is a greatly or slightly increased risk of disease, and there is uncertainty about the meaning of the research results. Women seemed to have a more conservative approach toward disclosure preferences, being less likely to want disclosure of results that confer a slight disease risk, have no effective treatment or prevention available, or are uncertain. This finding is consistent with evidence that women are more risk averse than men.³¹ In analysis using GEE, however, we did not find an association of most characteristics and type of result. A puzzling finding was that nonwhites were less likely to prefer disclosure even when effective treatment is available. This finding may reflect distrust in the clinical and/or research community where perceived discrimination from sample identification may occur.²¹ Our multivariable analysis found that depression and/or anxiety and type 2 diabetes are associated with participants being less likely to want disclosure of research results that carry a greatly increased risk of disease. This finding suggests that we should consider participants' physical and mental health before deciding whether to return a genetic test result. Because of the small sample size of individuals with depression and/or anxiety or type 2 diabetes (17% and 9%, respectively), a larger sample size may be needed to accurately analyze the preferences of these 2 disease groups.

Participants in our study identified primary care practitioners and medical specialists as clinicians with whom they would be most likely to share genetic research results. These practitioners may be least prepared to interpret and manage results. The availability of follow-up is an important component of a disclosure plan. Clinician capacity and service quality may be affected by disclosure.^{5,32} The genetic research community will need to work closely with clinicians to develop strategies for the responsible and efficient disclosure of complex and uncertain genetic information.

To our knowledge, there is no quantitative data on participants' preferences for sharing genetic research results after death. Participants in this project overall seemed interested in sharing results with relatives after their death, but family members may not want to know. McGuire et al¹⁶ recommend that researchers conducting whole-genome sequencing take a family-centered approach to informed consent to ensure that family members understand the potential implications for themselves of the research. Future research should assess attitudes of family members who receive participants' research results after the participant's death.

Our study results should be understood in the context of several limitations. Our findings may reflect response bias because older participants, women, nonwhites, those with a college degree or higher, and patients who live with someone were significantly more likely to respond to our survey. Results may not be generalizable to other populations. Whites were compared with nonwhite groups to enhance statistical power; however, nonwhite participants may have diverse preferences. Future research should include larger numbers of

nonwhite populations to elucidate differences in disclosure preferences across diverse racial groups. The survey assessed participants' preferences through hypothetical scenarios, which may not directly transfer to real-life situations. Although our survey was rigorously pilot tested, it was not validated. It is possible that sex and race differences noted in the findings may be reflective of different demographic groups interpreting the questions differently. Future research studies in this area should consider asking participants for self-assessments of broad concepts such as health and disease, offering participants customized vignettes, and using a validating survey instrument.³³ A strength of this study was that an overly conservative statistical approach was used in the multivariate modeling. By dichotomizing response variables as definitely yes vs. all other options, we are likely underestimating the association between predictors and participant preferences.

Conclusions

Participants in the OurGenes biobank have a strong preference to receive genetic research results, even when there is uncertainty around the meaning of the research result. Participants want to disclose results to their primary care practitioner and to have results disclosed to their nearest biological relative after death. Future studies should examine best practices for disclosing research results.³⁴ By considering participants' preferences and increasing knowledge of the effect of research in medicine, we can ensure the sustainability of patient participation in research.³⁴

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Abbreviations and Acronyms

BWH	Brigham and Women's Hospital
GEE	general estimating equation
IRB	institutional review board
OR	odds ratio
OurGenes	OurGenes, OurHealth, OurCommunity

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FIGURE.
Interest in disclosure of genetic research results in various hypothetical situations.

TABLE 1

Characteristics of Respondents and Non respondents

Characteristic	Respondents (n=555)	Non respondents (n=599)	P
Demographic characteristics			
Age, mean (SD), y	585 (14.0)	55.6 (16.2)	.002
Female	369 (66.5)	381 (63.6)	.30
Race			
White	485 (87.4)	440 (73.5)	<.001
Black	32 (5.8)	76 (12.7)	<.001
Hispanic	16 (2.9)	44 (7.4)	<.001
Other	22 (4.0)	39 (6.5)	.053
Educational level			
High school or less	86 (15.5)	146 (24.4)	<.001
College (any)	233 (42.0)	222 (37.1)	.09
Graduate school	189 (34.1)	136 (22.7)	<.001
Living alone	180 (34.4)	237 (44.5)	<.001
Health behaviors			
Smoking			
Never	296 (53.3)	281 (46.9)	.03
Past	200 (36.0)	200 (33.4)	.34
Current	27 (4.9)	50 (8.4)	.02
Alcohol intake (any)	331 (63.7)	304 (57.4)	.04
Exercise hours per week			
None	124 (23.8)	141 (26.8)	.27
0-2	173 (33.2)	192 (36.4)	.27
2-6	175 (33.6)	139 (26.4)	.01
7	49 (9.4)	55 (10.4)	.58
Clinical characteristics			
Body mass index			
Normal	190 (34.2)	174 (29.1)	.06
Overweight	175 (31.5)	173 (28.9)	.33
Obese	157 (28.3)	184 (30.7)	.37
Hypertension	222 (40.0)	224 (37.4)	.36
High cholesterol level	174 (31.4)	163 (27.2)	.12
Heart disease	85 (15.3)	71 (11.9)	.09
Type 2 diabetes mellitus	50 (9.0)	67 (11.2)	.22
Asthma	57 (10.3)	63 (10.5)	.89
Depression and/or anxiety	97 (17.5)	112 (18.7)	.59
Osteoarthritis	72 (13.0)	76 (12.7)	.88
Rheumatoid arthritis	50 (9.0)	61 (10.2)	.499
Osteoporosis	43 (7.8)	33 (5.5)	.13
Cancer	25 (4.5)	36 (6.0)	.25

Data are presented as No. (percentage) of participants unless otherwise indicated

TABLE 2

Comparison of Respondent Characteristics With Interest in Disclosure of 5 Different Types of Genetic Research Results^a

Characteristic	Effective treatment available	No effective treatment available	Greatly increased risk of disease	Slightly increased risk of disease	Uncertainty about meaning of results
No. (%) of definite yes responses	486 (90)	308 (64)	416 (79)	333 (66)	261 (57)
Demographic predictors					
Mean age	0.99 (0.97-1.01)	1.01 (0.99-1.02)	1.01 (1.00-1.03) ^b	1.02 (1.00-1.03) ^b	1.01 (0.99-1.02)
Female	0.85 (0.44-1.63)	0.57 (0.37-0.89) ^b	0.79 (0.48-1.29)	0.54 (0.35-0.84) ^b	0.65 (0.43-1.00) ^b
Nonwhite ^c	0.40 (0.19-0.86) ^b	0.94 (0.50-1.78)	0.62 (0.32-1.20)	0.84 (0.46-1.55)	0.92 (0.49-1.73)
High school or less	0.78 (0.37-1.64)	1.30 (0.72-2.37)	0.83 (0.45-1.54)	0.92 (0.52-1.60)	1.66 (0.93-2.97)
Living alone	0.85 (0.45-1.59)	0.93 (0.61-1.43)	1.37 (0.83-2.27)	1.33 (0.86-2.06)	1.13 (0.74-1.74)
Clinical predictors					
Depression and/or anxiety	1.45 (0.64-3.27)	0.73 (0.45-1.21)	0.51 (0.30-0.86) ^b	0.95 (0.58-1.56)	0.76 (0.46-1.25)
Type 2 diabetes mellitus	0.48 (0.21-1.10)	0.68 (0.33-1.39)	0.45 (0.22-0.91) ^b	0.73 (0.36-1.48)	0.63 (0.32-1.26)

^a Data are presented as odds ratios (95% CIs) unless otherwise indicated.

^b OR (95% CI) statistically significant

^c Significant interaction between nonwhite race and preference for disclosure if effective treatment is available in the multivariate model.

TABLE 3
Association Between Demographic Characteristics and Choice for Communication of Results With Practitioners^a

Characteristic	Primary care physician	Genetic counselor	Specialist	Genetics physician
No. (%) of definite yes responses	372 (71)	217 (42)	335 (64)	195 (37)
Demographic predictors				
Mean age	0.98 (0.97-1.00) ^b	1.00 (0.98-1.01)	0.99 (0.97-1.00) ^b	1.00 (0.98-1.01)
Female	0.77 (0.51-1.15)	1.23 (0.84-1.80)	0.58 (0.39-0.88) ^b	0.81 (0.55-1.19)
Nonwhite	1.38 (0.74-2.60)	0.86 (0.49-1.51)	0.51 (0.29-0.90) ^b	1.10 (0.63-1.95)
High school or less	1.19 (0.70-2.02)	1.14 (0.70-1.86)	1.02 (0.61-1.69)	0.88 (0.53-1.46)
Living alone	1.07 (0.71-1.61)	1.19 (0.81-1.74)	0.83 (0.56-1.24)	0.98 (0.66-1.45)

^aData are presented as odds ratios (95% CIs) unless otherwise indicated. For each response category, we conducted a multivariate logistic regression model adjusted for age, sex, race, educational level, and living alone.

^bOR (95% CI) statistically significant.