EDUCATION REPORT | Genetics inMedicine

Effectiveness of a Web-based genomics training for health educators in Texas

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Purpose: With advanced genomic developments, better prevention strategies are available via personalized genomic services. Because there is a shortage of genetic professionals, and primary-care providers are overwhelmed with routine practice, involving health educators—whose expertise includes educating the general public and promoting healthy behavior—to provide basic genomics education may facilitate better services. We developed the first evidence- and theory-based family health history Web-based training for Texas health educators. This report presents its evaluation results.

Methods: Approximately one-third of Texas health educators holding (Master) Certified Health Education Specialist designation (~40% were racial/ethnic minorities) participated in the family health history Web-based training. Attitudes, self-efficacy, intention, knowledge, and practice were assessed at baseline, immediately after training, and 3 months posttraining. Qualitative data were collected to provide additional evaluation findings.

Results: Participants significantly improved their attitudes, knowledge, intention, and self-efficacy regarding family health history education, immediately posttraining and after 3 months. The number of participants practicing family health history was significantly increased. Participants' overall assessment of the program was positive.

Conclusion: This family health history Web-based training successfully increased the number of genomically competent and culturally diverse Texas health educators. Ongoing efforts are needed to sustain and expand this education as well as to disseminate it to all health educators in the United States.

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Key Words: education; evaluation; family health history; genetics; genomics; health educator

INTRODUCTION

With recent developments in genomic technologies and information, better strategies for prevention are becoming available via personalized genomic health care and health promotion services.[1] Given that there is a shortage of genetic professionals,[2] and primary-care providers are overwhelmed with routine practice,[3] involvement of health educators—who are trained in educating the general public and promoting healthy lifestyles—in the provision of basic genomics education to patients and lay communities may facilitate better quality of personalized genomic services.[2,4] For example, health educators can work with health-care providers to develop and implement family health history (FHH) education programs for individuals and families. Through these programs, health educators can teach clients the importance of collecting comprehensive FHHs and discussing them with health-care providers. Health educators can also identify, address, and overcome associated barriers to facilitate clients' collection and discussion of FHHs, and provide them with FHH-based lifestyle recommendations.[5]

The National Human Genome Research Institute (NHGRI)[6] defines health educators as the professionals who explain and disseminate genomic information, raise awareness of genomic technologies, and educate the general public regarding relevant healthy behaviors. Alongside the NHGRI, the Centers for Disease Control and Prevention (CDC)[7] has developed seven genomic competencies for health educators, including translating genomic information, assessing needs and promoting genomics education for communities, and incorporating genomics into health education programs.

According to the Department of Labor,[8] there are 63,400 health educators in the United States, with a 37% projected increase in the next 10 years—significantly faster than the national average increase for all occupational groups (14%). Despite the fast-growing number of health educators and the important contributions they can make to basic genomics education, this professional group has inadequate genomic competencies to provide such education.[9] For example, approximately two-thirds of health educators are reluctant to incorporate the CDC-proposed genomic competencies into their practice.[9] Similar to other nongenetics health professionals, lack of genomic knowledge is the main barrier precluding their practice.[10]

Fortunately, although most health educators have not developed their genomic competencies, the majority are interested in genomics education.[11,12] In particular, according to nearly 1,000 health educators surveyed by the first author,[12] they are especially interested in genomic disorders/diseases, FHH or

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genetic risk assessments, and how to link genomics to health promotion. Continuing education, Web-based training, and professional conferences are the most desirable educational approaches.

Based on these needs assessment data, we developed, implemented, and evaluated the first evidence- and theory-based FHH training program to promote Texas health educators' practice of genomics. We chose FHH as the theme for this first genomics education program on the basis of the needs assessment data as well as two other important factors. First, FHH is an essential genomic competency advocated by various leading agencies and organizations.[2,13] Second, because health educators are not ready to practice "genomically," training health educators to elicit and use FHH—a tool that is relatively easy to grasp and incorporate into practice—may be feasible and attractive. The success of the initial training may generate stronger interest and willingness to participate in further, advanced genomics education.

The FHH training program has multiple components.[14] This report focuses on one of its key components. Specifically, we report the evaluation results of the FHH Web-based training, which targeted Texas health educators holding Certified Health Education Specialist (CHES)/Master CHES (MCHES) designations. We sought to address the effects of the FHH Web-based training on (i) Texas health educators' knowledge, attitudes, self-efficacy, and intention to incorporate FHH into their health education practice; and (ii) their practice (i.e., incorporating FHH) and the associated barriers and facilitators. We also present participants' assessment of the FHH Web-based training in this report.

MATERIALS AND METHODS

Participants

Potential participants were Texas health educators holding a CHES/MCHES designation. The CHES/MCHES designation, granted by the National Commission for Health Education Credentialing (Whitehall, PA),[15] is a certification for health educators. Health educators must meet the eligibility criteria (e.g., graduating from health education related degrees, taking sufficient relevant courses, and/or having certain years of practice as health educators) to be eligible to take the CHES/MCHES exam. On passing the exam, a minimum of 75 continuing education contact hours is required every 5 years to maintain the CHES/MCHES status. We obtained the CHES/MCHES list from the National Commission for Health Education Credentialing, with 559 names of health educators in Texas. After removing the authors of this study ($n = 2$), and those who attended our previous genomics training in the format of workshops ($n = 10$) and pilot test ($n = 3$), 544 health educators holding the CHES/MCHES designation were eligible to participate in this study.

The FHH Web-based training

On the basis of our previous study,[9] we proposed a theoretical framework to explain health educators' likelihood of adopting genomic competencies into health promotion practice. The framework was adopted from social cognitive theory,[16] the theory of planned behavior,[17] and the diffusion of innovations theory,[18] and was later tested with 1,607 US health educators using a structural equation modeling technique. We adopted the key factors from this framework (i.e., knowledge, attitudes, self-efficacy, and intention) to develop the elements for the FHH Web-based training. Specifically, we developed four modules: Module 1 (WHAT): What is "FHH"? Module 2 (WHY): Why should health educators apply FHH assessments to health promotion practice? Module 3 (WHO): Who should conduct FHH education? Module 4 (HOW): How to do an FHH assessment and make appropriate behavioral or lifestyle recommendations, based on FHH information, to clients. Each module had corresponding learning objectives, addressing each construct of the theoretical framework. To make modules informative and interesting, they included text, figures, tables, photos, videos, and hyperlinks to additional resources. For example, the objectives of Module 4 were to teach participants how to draw FHHs and how to make lifestyle recommendations based on this information. Alongside the text and illustrative photos explaining the procedure, we provided the links to the Web and printable versions of the US Surgeon General's "My Family Health Portrait Tool," a lifestyle recommendations table, and a video tutorial. The table listed evidence-based behavior recommendations from authoritative health organizations for specific types of cancer and other diseases. The video used a case study of a woman with a familial pattern of breast cancer to demonstrate how to draw her FHH tree using the US Surgeon General's tool, how to read our lifestyle recommendation table, and how to make subsequent behavior recommendations. An advisory board consisting of two health educators, three basic and clinical geneticists, one genetic counselor, one cancer nurse, one nutritionist, and one Web-based continuing education expert guided the development of the modules and further reviewed the content for accuracy.

The FHH Web-based training focused on cancer—a common genomic disease involving complex genes, environment, and behavior interactions. This is because the health educators are interested in learning about genomic diseases.[11,12] Moreover, we had to meet the requirements of our funding agency—the Cancer Prevention and Research Institute in Texas—to select "cancer" as the main theme of the training.

The duration of the FHH Web-based training was 3 h. We chose to deliver the training in a Web-based format because previous data[11,12] indicated this approach was preferred and it had the potential to reach all health educators within the state. Moreover, this approach has been successfully adopted in past studies in genomics education for other health professionals.[19–21]

The FHH Web-based training was primarily programmed using Moodle software hosted by a private company (ClassroomRevolution, Baldwinsville, NY). It included a preassessment survey, four educational modules, a postassessment survey, a 3-month follow-up survey (hosted by Qualtrics (Provo, UT)—an online survey software), contact information with a specific e-mail address and a phone number, and

a question and answer section listing common technical and project-related questions that might be frequently asked by participants (e.g., How to play the video? How to receive continuing education contact hours after completing this course?).

Preassessment survey

All surveys were carefully developed by the research team to address the learning objectives and content of the modules. The preassessment survey included (i) demographic questions; (ii) questions measuring attitudes with three belief and three value items (e.g., How much do you agree or disagree that health educators should add FHH assessments to their health education activities?); (iii) a self-efficacy scale with eight items (e.g., How confident are you that you can incorporate FHH assessments in your routine practice?); (iv) an intention scale with eight items (e.g., How likely are you to assist a client to draw a FHH using the US Surgeon General's "My Family Health Portrait"?); and (v) knowledge scales with 19 multiple choice items (e.g., When using the US Surgeon General's "My Family Health Portrait," which disease/condition can you choose to focus on?). Moreover, six behavior/practice questions were also asked in the survey.

Postassessment survey

The postassessment survey had identical questions for attitudes, knowledge, intention, and self-efficacy as asked in the pretest. In addition, the postassessment contained questions evaluating the course itself: (i) How well did each module achieve its specific learning objectives? (ii) What did participants think about the appearance, user-friendliness, content, and organization of the training? (iii) What were participants' experiences with and recommendations for improving the FHH Web-based training?

Three-month follow-up survey

In addition to the similar attitude, knowledge, intention, self-efficacy, and behavior questions in the preassessment survey, several questions were added to the 3-month follow-up survey. These items included (i) barriers and facilitators affecting participants' utilization of FHHs in their practice during the 3-month posttraining period; and (ii) further recommendations and feedback regarding the FHH Web-based training.

Data collection

Between February and March 2012, we sent three e-mails (one notification and two reminders) and two postcards to invite 544 eligible Texas health educators with CHES/MCHES status to register and take the FHH Web-based training. Twenty-two e-mails were undelivered due to invalid e-mail addresses. All participants were required to self-register and take a preassessment survey before accessing the modules. After the completion of the modules, they were immediately asked to answer a postassessment survey. A $25 gift card and 3 continuing education contact hours were given to each participant who completed a preassessment survey, four modules, and a postassessment survey (i.e., the posttest group) to compensate for their time and effort. After 3 months, with an additional $25 gift card incentive, one notification and two reminder e-mails were sent to members of the posttest group to invite them to complete a follow-up survey.

The FHH Web-based training's modules, recruitment materials, and surveys were pilot tested with nine Texas health educators and three consultants in each stage and further revised, accordingly. All data collection procedures were approved by the institutional review board of Texas A&M University.

Data analysis

Quantitative evaluation

Data validity/reliability. The internal consistency reliability (i.e., Cronbach's α) of the attitudes, self-efficacy, and intention scales was calculated using SPSS 17.0 (SPSS, Chicago, IL), and the construct validity of each measure was tested through a confirmatory factor analysis using Mplus 6.0 (Muthén & Muthén, Los Angeles, CA). Data showed that the reliability and validity of the attitudes, self-efficacy, and intention scales were good (attitudes scale: α = 0.81 and confirmatory factor analysis model: $\chi(7)^2 = 38.63$, $P < 0.001$, comparative fit index (CFI) = 0.94, standardized root mean square residual (SRMR) = 0.05; self-efficacy scale: $\alpha = 0.90$ and confirmatory factor analysis model: $\chi(17)^2 = 89.55$, $P < 0.001$, comparative fit index (CFI = 0.91, SRMR = 0.07; intention scale: $\alpha = 0.93$ and confirmatory factor analysis model: $\chi(17)^2 = 82.31$, $P < 0.001$, CFI = 0.93, SRMR = 0.06).

Pattern of attrition. Using SPSS 17.0, the demographic variables of non-attritors and attritors in the posttest and follow-up phases were examined through independent *t*-test (e.g., age, years of graduation, and years of practice), Fisher's exact test (e.g., gender), and likelihood ratio test (e.g., education, ethnicity, religion, and practice setting). Attrition analysis showed that there were no significant differences in demographic characteristics between non-attritors and attritors in the posttest and follow-up phases. Full information maximum likelihood estimation method was used for handling the missing data.[22]

Intervention/education effects. The changes in attitudes, self-efficacy, intention, and knowledge were tested using paired *t*-test from pretest to posttest groups, from posttest to follow-up groups, and from pretest to follow-up groups under the structural equation modeling framework, with the use of the robust maximum likelihood estimation method in Mplus 6.0.[23]

Qualitative evaluation

With the assistance of QSR Nvivo 9.0 (QSR International, Burlington, MA), the content of the qualitative data provided in the postassessment and follow-up surveys was analyzed for salient themes. Themes included participants' perceived barriers and facilitators affecting adoption of FHH into their practice, as well as their satisfaction with or recommendations for this FHH Web-based training.

RESULTS

Sample characteristics

Among 544 eligible Texas health educators with CHES/MCHES, 207 (38.1%) completed the preassessment surveys

Table 1 Demographic characteristics of participants in pretest, posttest, and 3-month follow-up

	Pretest group (*n* = 207)		Posttest group (*n* = 173)		Follow-up group (*n* = 137)	
Variable	***n***	**(%)**	***n***	**(%)**	***n***	**(%)**
Age	35.1 (10.0)[a]	22–65[b]	35.0 (9.9)[a]	22–65[b]	34.9 (9.9)[a]	22–65[b]
Years of graduation	6.6 (6.3)[a]	0–32[b]	6.4 (6.1)[a]	0–32[b]	6.5 (6.3)[a]	0–32[b]
Years of practice	7.6 (7.1)[a]	0–34[b]	7.5 (6.9)[a]	0–31[b]	7.2 (6.8)[a]	0–31[b]
Gender						
Male	17	(8.2%)	16	(9.2%)	12	(8.8%)
Female	190	(91.8%)	157	(90.8%)	125	(91.2%)
Race/ethnicity						
White/Caucasian	120	(58.0%)	102	(59.0%)	81	(59.1%)
Hispanic/Latino	43	(20.8%)	34	(19.7%)	26	(19.0%)
Black/African American	33	(15.9%)	28	(16.2%)	22	(16.1%)
Asian/Pacific Islander	10	(4.8%)	8	(4.6%)	7	(5.1%)
American Indian/Alaskan Native	1	(0.5%)	1	(0.6%)	1	(0.7%)
Religious belief						
Christian	173	(83.6%)	144	(83.2%)	113	(82.4%)
No religion	21	(10.1%)	17	(9.8%)	15	(10.9%)
Other	13	(0.1%)	12	(0.1%)	9	(0.1%)
Education						
Bachelor's degree	61	(29.5%)	52	(30.1%)	40	(29.2%)
Master's degree	132	(63.8%)	110	(63.6%)	89	(65.0%)
Doctoral degree	14	(6.8%)	11	(6.4%)	8	(5.8%)
Practice setting[c]						
Health-care setting	37	(17.9%)	31	(17.9%)	27	(19.7%)
Community setting	37	(17.9%)	31	(17.9%)	20	(14.6%)
Business/industry setting	31	(15.0%)	24	(13.9%)	19	(13.9%)
College/university setting	23	(11.1%)	17	(9.8%)	14	(10.2%)
School (K–12) setting	12	(5.8%)	9	(5.2%)	7	(5.1%)
University health services setting	8	(3.9%)	7	(4.0%)	4	(2.9%)
Other	59	(28.5%)	54	(31.2%)	46	(33.5%)

The ethnic distribution of participants in this study is comparable to the National Commission for Health Education Credentialing, Inc. data regarding the ethnic distribution of the health educators holding a CHES/MCHES designation in Texas.

CHES/MCHES, Certified Health Education Specialist/Master Certified Health Education Specialist; K–12, kindergarten to 12th grade.

[a]Mean (SD). [b]Range. [c]The categories of practice setting are the same as the classification utilized by the National Commission for Health Education Credentialing, Inc.

(pretest group), 173 (31.8%) finished taking the FHH training modules and postassessment surveys (posttest group), and 137 (25.2%) later completed the 3-month follow-up survey (follow-up group). Table 1 presents the demographic information for these three groups.

Attitudes, self-efficacy, and intention

As seen in Table 2, at pretest, baseline averages for attitudes, self-efficacy, and intention were 30.5 (SD = 8.6), 42.71 (SD = 17.3), and 23.5 (SD = 5.3), respectively. After completing the FHH Web-based training, the posttest scores significantly improved: attitudes (mean = 36.3; SD = 9.0; $P < 0.001$), self-efficacy (mean = 60.1; SD = 14.3; $P < 0.001$), and intention (mean = 26.6; SD = 5.2; $P < 0.001$). Although the 3-month follow-up scores for attitudes (mean = 33.9; SD = 9.9; $P = 0.005$) and self-efficacy (mean = 53.9; SD = 15.0; $P < 0.001$) dropped as compared with the posttest scores, they remained significantly higher than at pretest ($P_s < 0.001$ for attitudes and self-efficacy). Similarly, the follow-up intention score was significantly higher than at pretest, but there was no significant difference between follow-up and posttest values (mean = 25.9; SD = 4.9; $P = 0.14$).

Table 2 Attitudes, intention, and self-efficacy scores in pretest, posttest, and 3-month follow-up

Measured variable	Possible range	Pretest	Posttest	Follow-up
		Mean (SD)	Mean (SD)	Mean (SD)
Attitudes	3–48	30.5 (8.6)	36.3 (9.0)[a]	33.9 (9.9)[a,b]
Self-efficacy	0–80	42.7 (17.3)	60.1 (14.3)[a]	53.9 (15.0)[a,b]
Intention	8–32	23.5 (5.3)	26.6 (5.2)[a]	25.9 (4.9)[a]

[a]Significant improvement from the pretest score at 0.05 α level. [b]Significant decrease from the posttest score at 0.05 α level.

Knowledge

The surveys contained 19 items assessing knowledge. Participants answered 61.6, 80.3, and 71.9% of knowledge items correctly in the pretest, posttest, and 3-month follow-up, respectively. The knowledge score at the posttest was significantly higher than at pretest ($P < 0.001$). Although this score decreased in the follow-up, it remained significantly higher than the pretest value ($P < 0.001$).

Behavior/practice

Figure 1 shows the changes in the specific behaviors assessed at pretest, posttest, and follow-up. Compared with the pretest, Texas health educators who participated in the FHH Web-based training reported significant improvement in how much they were implementing the following practice behaviors: (i) incorporating FHH assessments into their routine practice (mean increase ~18.0%; $P = 0.001$); (ii) encouraging clients to discuss their FHH with family members (mean increase ~17.0%; $P = 0.003$); (iii) making appropriate behavioral or lifestyle recommendations to clients, based on their FHH (mean increase ~15.0%; $P = 0.012$); (iv) encouraging clients to consult relevant health-care providers about their FHH (mean increase ~13.0%; $P = 0.013$); (v) encouraging clients to edit and/or add information to their FHH (mean increase ~13.0%; $P = 0.012$); and (vi) assisting clients to develop/draw their FHH using the US Surgeon General's "My Family Health Portrait tool" (mean increase ~10.0%; $P = 0.007$).

Moreover, findings based on the qualitative data collected during the 3-month follow-up survey revealed work setting–related obstacles (e.g., not working directly with clients, not seeing clients on an individual basis, and lack of high-level administrative support) as the main barrier affecting participants' practice. For example, one of the participants claimed, "I don't have opportunities to work with individuals. The work I do involves presentations for large groups and consulting for practitioners [who] do work with individuals directly." Another health educator pointed out the challenge of needing to "request approval and get buy-in from upper leadership," which precluded adopting FHHs in her practice.

Participants also mentioned several facilitators promoting the adoption of FHHs into their routine practice. The most frequently identified facilitator was the perceived imperativeness of FHHs, as seen in their comments: "I believe that this [FHH] is an important part of a person's health history, which makes me more likely to take the time to make sure this is a part of the visit," and "When I have introduced some of the concepts, it was with the intention of informing/educating the general public of the importance of knowing and discussing medical and genetic history for the sole purpose of developing better strategies for prevention. The facilitating factor can be summed up in this manner … knowledge is power." Other facilitating factors stated by participating health educators included positive feedback from clients, and that the work that some health educators were already performing was related to FHH, which enabled them to easily incorporate FHH-related tasks into their work routine.

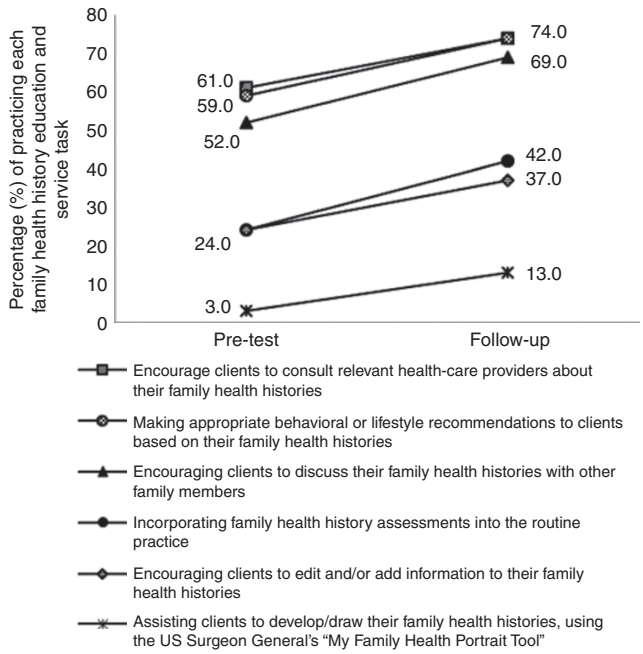

Figure 1 Changes in the percentages of practice in family health history education and service between pretest and 3-month follow-up. The percentages of Texas health educators practicing each family health history education and service task increased significantly from pretest to 3-month follow-up (Ps < 0.05).

Overall assessment and participants' satisfaction

The majority of health educators taking our FHH Web-based training believed that the educational modules assisted them in understanding how to use FHH in health education either "very well" or "well" (98.8%) and the difficulty level was either "extremely appropriate" or "appropriate" (93.6%). Table 3 shows participants' ratings regarding how well each module achieved its specific learning objectives. Module 2 had the highest rating (i.e., 96.5% rated Module 2 as meeting the objective—being able to explain why health educators should routinely include FHH assessments in their health education efforts—either "very well" or "well"). Conversely, Module 3 had the lowest rating (i.e., 80.9% rated Module 3 as having met "very well" or "well" the learning objective of being able to describe what has been done—so far—in the professional field of health education related to genomics and FHH, and describe some of the resources available for [and developed by] health educators).

Overall, participants were either "very satisfied" or "satisfied" with the order (98.8%), organization (98.8%), user-friendliness (93.1%), and appearance (86.7%) of the Web-based training. Most participants (90.7%) reported that they enjoyed the experience of learning about FHH online, "somewhat" or "extremely." We also asked participants to rate their experience with this training on a scale from 1 ("absolutely hated it") to 10 ("absolutely loved it"), and the average rating was 8.0 (SD = 1.4; range 4–10). Finally, almost all participants (97.7%) were either "very willing" or "willing" to recommend this training to their professional colleagues and friends.

Table 3 Texas health educators' ratings regarding how well the modules of family health history (FHH) Web-based training achieved the learning objectives

Modules	Constructs being targeted	Learning objectives	Main content	Not well at all/ somewhat well (%)	Well/ extremely well (%)
1[a]	Knowledge	Be able to define the term "FHH," as the term is currently used in health promotion	• Definitions and meanings of FHH	7.0	93.0
	Knowledge	Be able to briefly describe how FHH assessments can be (and have been) used throughout the history of health care and health promotion	• History of the FHH usage • Timeline of key events in the history of genetics • The Human Genome Project	4.6	95.4
	Knowledge	Be able to list the five most prevalent types of cancer currently affecting people in the state of Texas	• Most common cancers in Texas and the United States • Comparison of cancer incidence rates between Texas and the United States	8.7	91.3
	Knowledge	Be able to briefly explain why cancer is considered a genomic disorder	• Genetics vs. genomics • Genetic disorders vs. genomic disorders • Formation of cancer • Cancer genes	9.2	90.8
2[b]	Knowledge/ attitudes	Be able to explain why FHH assessments can be a useful tool for health promotion and disease prevention	• FHH assessments and their use in health promotion and disease prevention • Role of FHH in understanding personal risk of illness • FHH vs. genetic testing	4.6	95.4
	Knowledge/ attitudes	Be able to explain why FHH assessments can be a useful tool for cancer prevention, specifically	• Role of FHH in cancer prevention	5.2	94.8
	Knowledge/ attitudes	Be able to explain why health educators should routinely include FHH assessments in their health education efforts	• Health educators' responsibilities to develop genomic competencies • Health educators' responsibilities to adopt FHH into routine practice	3.5	96.5
3[c]	Knowledge	Be able to distinguish how genetic counselors and health educators differ in terms of the skills and approaches they use when incorporating FHH assessments into their practice	• Genomic competencies and the use of FHH for health educators • Comparison of genomic competencies/skills between health educators and genetic counselors	17.4	82.6
	Knowledge	Be able to describe what has been done—so far—in the professional field of health education, related to genomics and FHH, and describe some of the resources available for (and developed by) health educators	• State-of-the-art literature in FHH and genomics in health education • Relevant resources in FHH and public health genomics	19.1	80.9
4[d]	Knowledge/ self-efficacy	Be able to practice developing a simple FHH using the US Surgeon General's "My Family Health Portrait Tool"	• FHH collection tools • Demonstration and practice of how to use the US Surgeon General's "My Family Health Portrait Tool"	13.9	86.1
	Self-efficacy/ intention	Be able to develop a plan to add FHH assessments into routine health education practice	• Steps to incorporate FHH assessments into health education practice	17.9	92.1
	Self-efficacy/ intention	Be able to—based on FHH information—make appropriate behavioral or lifestyle recommendations to clients who might be at risk for the most common types of cancer currently affecting people in Texas	• Introduction of evidence-based behavioral recommendations for diseases listed by the US Surgeon General • How to make appropriate behavioral recommendations to clients according to their FHH information	11.6	88.4
	Self-efficacy/ intention	Be able to—based on FHH information—encourage clients to edit and/or add information to their FHH and consult relevant health-care providers about their medical family histories	• Suggestions to motivate clients to finish and submit detailed FHH information • Key points in the FHH practice and follow-up service	8.7	91.3

FHH, family health history.

[a]Module 1 (WHAT): What is "FHH"? [b]Module 2 (WHY): Why should health educators apply FHH assessments to health promotion practice? [c]Module 3 (WHO): Who should conduct FHH education? [d]Module 4 (HOW): How to do a FHH assessment and make appropriate behavioral or lifestyle recommendations, based on FHH information, to clients?

Participants' comments about this FHH Web-based training were overall very positive. The features participants appreciated the most included (i) the links, videos, and FHH tools embedded in the modules; (ii) the topic, length, and amount of information; and (iii) the organization, format, user-friendliness, and online delivery platform of the training. Some participants also mentioned the need to have more FHH and genomics training for health educators and other health professionals.

Yet participants also made several suggestions to improve the Web-based training, related to (i) technical issues (e.g., preferring to open links in a separate window); (ii) layout and interactivity (e.g., adding more audio/visual and interactive components); (iii) content (e.g., expanding Module 3); and (iv) "showcasing," or the possibility of presenting case studies and examples of actual implementation efforts.

Furthermore, we asked health educators to list additional topics that they would like to learn about in future training programs. The topics included more in-depth information about FHH and genomics, job-related issues, genomic disorders other than cancer, race and genomics, cultural competencies in FHH education, genetic testing and counseling, and health insurance and legal issues related to genomics.

DISCUSSION

As the first genomics education program for health educators (to the best of our knowledge), our FHH Web-based training successfully reached Texas health educators—approximately one-third of health educators holding the CHES/MCHES designation in the state of Texas completed our training. Such successful recruitment of participants could be explained by several factors. First, the training was based on previous needs assessment data that suggested that health educators were interested in genomics education.[11,12] We also selected the topic (i.e., FHH and cancer) and approach (i.e., the Web-based delivery format) that were desirable to health educators. Second, we used multiple strategies to advertise this training, including exhibitions at three major Texas health education conferences, presentations at state and national professional meetings, and the development of our own website (http://cancergenomics.tamu.edu). Potential participants received three e-mails and two postcards inviting them to take the training. Finally, the incentives—3 h of free continuing education hours and $50 in the form of gift cards—might also have been attractive to the health educators in this study.

Interestingly, our training attracted Texas health educators with racial/ethnic minority backgrounds—~40% of participants were non-White. Because racial/ethnic minority communities often face barriers to access genetic services[2] in the form of language, culture, literacy, and mistrust, health educators with minority backgrounds may serve as liaisons between their communities and the health-care system. For example, with the input from both health-care providers and racial/ethnic minority communities, health educators with similar racial/ethnic backgrounds can design culturally and linguistically appropriate FHH education programs and materials targeting the needs among their community. Such efforts may contribute to reducing genomics-related health disparities. Moreover, given that racial/ethnic minority genetic specialists are under-represented in genomic services,[2] engaging the diverse health education workforce in basic FHH training may also facilitate the satisfaction and utilization of genomic services among patients from racial/ethnic minorities.

Of note, our findings showed that Texas health educators in the FHH Web-based training significantly improved their knowledge, attitudes, intention, self-efficacy, and practice behavior regarding the use of FHHs for health promotion. In other words, after attending the training, participating Texas health educators increased knowledge of FHH, valued FHH more than before, were more likely to use FHH in their daily work, and felt more confident in adopting FHH in health promotion practice. Moreover, larger number of health educators claimed to be using FHH approaches in their health promotion efforts posttraining. Such improvement can, at least in part, be explained by the quality of the training and the long-term commitment of the research team to educating health educators about genomics. Specifically, the FHH Web-based training built upon the first and second authors' prior work since 2004,[4,9–12] was theory and evidence based, and underwent careful planning and implementation. The program's design—carried out by health educators for health educators, to emphasize the competencies, responsibilities, and ethical guidelines of the profession—may also have contributed to the positive outcomes. The success of this Web-based training suggests additional efforts should be directed at sustaining the gains seen in our sample and reaching health educators outside of Texas.

Despite the success of this project, there remain some specific challenges. First, Module 3 had the lowest rating from participants regarding how well the learning objective was met. Further revision and refinement of the module's contents may help address this concern. Second, on the basis of participants' feedback, future FHH Web-based training efforts should be more interactive, attractive, and easy to use; contain more advanced content; address other topics suggested by participants (e.g., advanced module in FHH, basic genomics, genetic testing, and cultural competencies); and target barriers to professional practice (e.g., how to incorporate FHH into different work settings). Furthermore, due to the limited time frame of this 2-year funded project, participants had <2 months to complete the training. We could only collect short-term follow-up data and could not design and offer more education opportunities to participants. It is important that future training programs (i) allow more time for participants to take the training; (ii) collect long-term follow-up data to assess the sustainability of FHH Web-based training; (iii) develop newsletters with updated materials to sustain the development of new knowledge over time; and (iv) add a series of "booster" or "refresher" sessions after the training to sustain and enhance health educators' learning and professional practice.

Researchers should bear in mind that findings from this study are not generalizable to the population of health educators, due to its biased sample and the limitations of the study's design. Participants in our training might have been biased by

a previous interest in FHH and/or genomics education. The study's design was a pre- and posttest design. Although pre- and posttest design is a commonly used approach in genomics education programs for health professionals,[20,24,25] such a design is not as rigorous as a randomized controlled trial study. Because this was the first-of-its-kind training for heath educators (to the best of our knowledge), we were unsure whether we would be able to recruit sufficient numbers of health educators for the training. Therefore, we chose to adopt a pre- and posttest design rather than a randomized controlled trial method, allowing for more flexibility in recruitment. Future trainings, however, may consider adopting a randomized controlled trial design to examine their effectiveness.

Despite these challenges and limitations, this FHH Web-based training successfully meets the needs of the health professional workforce for genomics education as characterized by the Secretary's Advisory Committee on Genetics, Health, and Society, Department of Health and Human Services.[2] In particular, we successfully reached approximately one-third of Texas health educators holding CHES/MCHES designation (~40% of whom were from ethnic/racial minorities) and significantly improved the factors influencing their practice, as well as the practice itself, related to FHH. Because health educators often serve as a bridge between health-care systems and lay people, the increased numbers of genomically competent and culturally diverse Texas health educators may contribute to better personalized genomic service for the lay and underserved communities in the state.

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DISCLOSURE

The authors declare no conflict of interest.

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