

# Designing e-Health Interventions for Low-Health-Literate Culturally Diverse Parents: Addressing the Obesity Epidemic

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## Abstract

*Child and adolescent obesity is a significant problem contributing to long-term trends in adult obesity. Educating parents about strategies for raising healthy children is complicated by the problem of low health literacy. E-health provides new opportunities to educate low-health-literate audiences, and this project was intended as formative research to guide design of interventions for low-health-literate parents. Focus groups were conducted with African American, Hispanic, and white parents (n = 43), 18 years of age or older, and at or below median income for the region. Each focus group included the following: a discussion of parents' general use of the Internet for health information, the demonstration of a Web site designed specifically for low-health-literate users, and asking participants about ideas under consideration for future interventions. Participants use search engines to look for health information and use heuristics, such as position in search results, to evaluate Web site quality. Some participants avoid information from .edu and .gov domains due to perceived complexity, and there was an almost-universal lack of trust in the government for health information. University researchers, by contrast, were trusted sources as information providers. Content and usability that meet the needs of extremely low-literate audiences may be perceived as slow and lacking depth by more literate and Internet-savvy users. E-health can be used to educate low-health-literate audiences, but interventions designed for these users must be layered in terms of content and usability to meet varying levels of functional and media literacy.*

**Key words:** telehealth, e-health, obesity, low-literate parents

## Introduction

Obesity is a problem in the United States. Recent research indicates that nearly 1 in 3 adults is obese, a number that is even higher among blacks (45%) and Hispanics (37%).<sup>1</sup> The problem of overweight and obesity is also present in children and adolescents. The number of overweight children has more than tripled, from 5% in 1980 to 17% in 2004 and has remained steady through 2006.<sup>1-3</sup>

Factors contributing to overweight and obesity in children and adolescents typically fall into three categories: genetic, behavioral, and environmental.<sup>4</sup> Race and ethnicity are also a factor, with 16% of white children and adolescents overweight, compared to 20% of blacks and 19% of Hispanics.<sup>1</sup> Among the reasons obesity may be more prevalent among minority populations are more accepting culturally based attitudes toward obesity and less knowledge of healthy eating habits and dietary guidelines.<sup>5-7</sup>

Research suggests this epidemic requires the creation of interventions with culturally relevant messages that can effectively respond to contributing factors such as family genetics, behaviors, and environment.<sup>8</sup> The emergence of digital media provides new opportunities to deliver such tailored health information.

Currently, more than 70% of adult Americans use the Internet and 80% of those users have used it for health information.<sup>9,10</sup> E-health, the delivery of health information and services via the Internet and related technologies,<sup>11</sup> provides opportunities for interventions targeting virtually any health concern. One benefit of e-health interventions is the flexible nature of digital media, which can facilitate message targeting and tailoring based on users' cultural and personal backgrounds. Indeed, tailored interventions have been used to educate users and contribute to behavior change across a variety of

health behaviors.<sup>12,13</sup> Additionally, the interactive nature of e-health applications can enhance learning.<sup>14,15</sup> Looking at obesity specifically, researchers have used e-health to educate users about fats and nutrition labels<sup>16</sup> and change behaviors related to eating more fruits and vegetables<sup>17</sup> and increasing physical activity.<sup>18</sup>

As researchers investigate the use of e-health to improve the health of the general population, it is important to recognize that approximately half of U.S. adults have low health literacy.<sup>19</sup> Health literacy refers to individuals' ability to obtain, process, and appropriately act on health information.<sup>19</sup> E-health researchers have long recognized the benefits of audiovisual information in reaching lower literate users,<sup>12</sup> utilizing best practices such as using pictures, nonmedical language, simpler words and sentence structures, and consistency in navigation.<sup>20</sup>

Focusing specifically on e-health for low-health-literate users, Whitten et al.<sup>21</sup> implemented and evaluated a Web site designed to provide diabetes education to low-health-literate audiences. That Web site relied almost exclusively on animated health providers, images, and audio to provide education. Results suggested that users were receptive to the design and learned from the intervention. A similar intervention was developed by the research group that focused on educating parents about raising newborns and young children. Both Web sites have been evaluated favorably in large surveys with a more generalizable Internet audience<sup>22</sup> and on mobile devices.<sup>23</sup>

Despite early successes related to the design of e-health applications for low-health-literate audiences, additional work is necessary to tap into the full potential of such interventions. This article reports research on how low-health-literate parents use the Internet for health information. It is intended as formative research to guide the design of culturally and family-relevant interventions to help these parents raise children with healthy eating and physical activity habits.

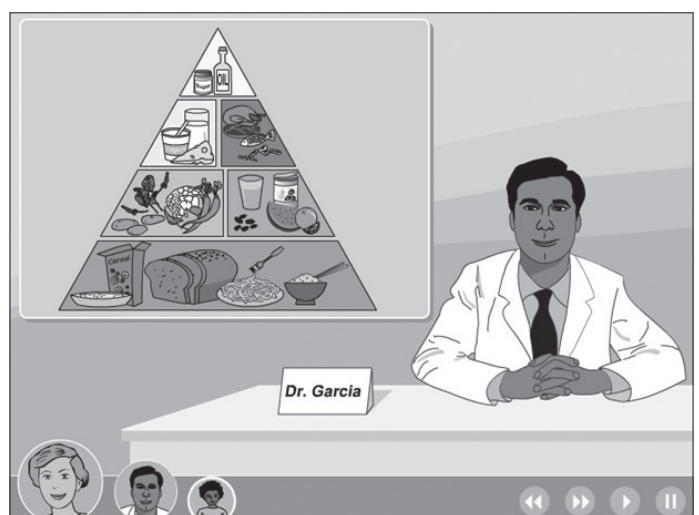
## Materials and Methods

To learn more about the challenges low-health-literate parents face in raising healthy children, a series of focus groups was conducted with parents in a midsized city in the southwestern United States. Participants ( $n = 43$ ) were parents 18 years of age or older, at or below median income for the area, who had not completed a 4-year college degree nor worked in the healthcare field.

Seven focus groups were conducted that consisted of African American mothers ( $n = 7$ ) and fathers ( $n = 3$ ;  $n = 6$ ), Hispanic mothers ( $n = 8$ ) and fathers ( $n = 6$ ), and white mothers ( $n = 7$ ) and fathers ( $n = 6$ ). Groups were divided based on ethnicity and gender to ensure that participants were comfortable discussing issues that might vary based on gender or cultural dimensions. A little more than a third of the

participants were married (39.5%), with the remainder single (23.3%), living with a partner but not married (18.6%), divorced (14.0%), separated (2.3%), or widowed (2.3%). Most participants had some college (53.5%) or completed a 2-year college program (16.3%), with the remainder high school graduates (25.6%) or having some high school (4.7%). Almost all participants had computer access (95.3%), and all of those individuals had Internet access.

Focus groups lasted for approximately 90 minutes each and were moderated by the same Hispanic female moderator in English using the same semistructured moderator guide. Each focus group began with a general discussion about the challenges parents face in helping children eat nutritiously and get regular physical activity. With this context established, the discussion moved to where parents go for health information and how parents use the Internet in particular to obtain health information; topics discussed at this point included which Web sites they rely upon for health information, how they judge Web site quality, and usability issues with health Web sites. As part of that conversation about online health information, participants watched a short demonstration of the Web site discussed earlier that was designed as an educational intervention for low-health-literate parents of newborns and adolescents (*Fig. 1*).<sup>22,23</sup> After that demonstration, participants were asked for their opinions of that particular intervention: both the content provided and the graphical appearance of the Web site. The ensuing discussion was then used to initiate conversation about how a new intervention of that kind might help parents raise healthier children.



**Fig. 1.** Child Care Center Web site.

Transcripts of all focus groups were analyzed by two coders to independently identify themes relevant to the design of new e-health interventions to help parents raise healthy children. Themes were identified by reading the transcripts and noting prominent themes repeated across focus groups. After achieving intercoder reliability of  $k = 0.87$  in practice coding, the full transcripts were analyzed.

All participants also completed the Short Test of Functional Health Literacy in Adults (STOFHLA), a timed fill-in-the-blank instrument that requires subjects to understand two vignettes: one about having a stomach radiograph and one based on a Medicaid application; scores on the STOFHLA range from 0 to 36.<sup>24,25</sup> Study participants scored an average of  $34.4 \pm 2.3$  on the STOFHLA. The high average score will be addressed below in a discussion of study limitations and directions for future research.

## Results

### GENERAL USE OF ONLINE HEALTH INFORMATION

Virtually all participants with Internet access had used it to look for health information. Many of them spoke of using search engines, with Google and Yahoo being popular examples. Participants discussed various heuristics for evaluating Web site quality, such as a high position in the search, as illustrated by this comment from a white father:

If you look up a drug on the Internet whether it's generic or branded, Google almost any drug and you are going to hit Wikipedia almost instantly, which is excellent. They have in-depth articles on pretty much every drug you can imagine.

This is particularly noteworthy when one considers the frequent prominence of Wikipedia—a user-edited encyclopedia that does not verify contributor credentials—at the top of search results. Two Hispanic fathers also commented on the evaluation of search results:

My experience has been that if you are looking up something medical and you read some paragraph, but it sounds somewhat... I don't know what the word is...research-y... Then you look up the link and it's something-something.edu, most likely I won't go there because it's most likely some research paper or something written in such a format that it's not helpful to me.

Yeah, it's not in layman's terms. Or if it's .gov, just skip it all together.

Given concerns about the complexity of some Web sites, one Hispanic father described a novel strategy for finding relevant content via search engines:

Sometimes...I do the search in the picture format rather than the text format. So....maybe it's melanoma, you have a visual, so [you] do the research on your pictures—the image search—and look at the picture and if it looks like something of quality, then maybe the link is a quality site. You can search it that way, too.

In addition to using search engines, many participants could recall specific Web sites they relied upon for health information. Perhaps not surprisingly, given significant television advertising and over 18 million unique visitors per month, one of the most commonly cited Web sites was WebMD.<sup>26</sup> Other Web sites mentioned included health organizations (e.g., American Diabetes Association) and diet programs (e.g., Weight Watchers). In addition to explicitly health-oriented Web sites, participants discussed more general Web sites like Oprah Winfrey's Web site, which was highlighted by African American mothers as a source of health information. When prompted about whether Oprah's Web site was trustworthy, one woman responded:

Yeah, I think because she has a doctor on it. Her Web site doesn't say, "This is what Oprah wants you do to." It tells you what the doctors say, and it gives you links to their sites to check it out. It's always something you can verify, that you can check out for yourself. She doesn't just say, "I want you to do this, or you should do this." It's a little more trustworthy.

The issue of trust in the context of online health information was a planned topic of discussion in all groups. Across all groups there was a strong opinion that the government was not to be trusted for health information. This was often due to perceived influence of corporations on the government's official positions and information. As an example, 3 white mothers spoke in succession about this:

No. I don't trust them.

Not the government or anything having to do with the government. I think they don't want you to know...for instance the pharmaceutical [industry]...you [to] know too much about healthy eating. They got a business."

Yeah, if you got an earache and use vinegar and that neutralizes the bacteria, and they want you to come in and take their antibiotics and eardrops and all that and go to the doctor. It's all interlinked.

### DEMONSTRATION WEBSITE CRITIQUE

After the discussion of general health information, the moderator demonstrated the Web site designed for low-health-literate audiences. Participants were shown a segment discussing the food pyramid, and

one complaint quickly arose in all groups: The content moved too slowly. A comment illustrative of this point came from a white father:

I was ready for the next step of content while the person was still speaking slowly and delivering the context. I would like to have had it available much faster.

For users used to reading health information online, where the pace is controlled entirely by the user, this format frustrated some. Beyond pace, some participants expressed a desire for more content, something deeper than what was being presented by the animated doctor.

Some parents voiced negative opinions of the animated doctors providing health information, comparing the quality of the intervention's graphics to what they saw in their children's video games. Two Hispanic mothers commented on the intervention:

I have to say this... that thing looks really cheesy. It looks old fashioned, out of touch.

Have you seen the graphics on Xbox? I mean that looks like it's from the 50s or something.

Such comments may reflect expectations unlikely to be achieved by any Web site at the moment, but it shows the comparisons parents are apt to make of any e-health intervention featuring animated characters. Other parents expressed favorable opinions of the animations, or suggested that the Web site format might be good for children or for parents and children to explore together. An example of this is from a Hispanic mother:

If that site was geared for us taking our children to learn, that would be perfect for a 3-year-old or up to grade school. If that's where they are going to go to learn about nutrition, that's exactly what I would like.

Participants also commented on Web site usability. While effective navigation was important to them, these parents were adamant on the importance of a search feature that would let them quickly find the content they were looking for. One of the white mothers said:

Instead of giving you a whole bunch of choices, [it should have] a search for a certain age group and the main problem. 'Cause when your kids are sick you don't want to be going through the whole Web site just to find something that is going to make them feel better right away.

While the Web site demonstrated in the focus group was designed to be an educational intervention more than an on-demand information resource, the importance of being able to search for health information—on the Internet in general and any particular Web site—was clear.

Having commented on the demonstrated Web site, participants were told that one goal of the project was to develop new educational content to help parents raise healthy children. Knowing this, they were asked about several issues under consideration for a new intervention. Given the lack of trust these parents placed in the government, it was suggested that a new Web site might be affiliated with a major university. This idea that was received positively, such as this from an African American father:

If it's through a college, or something like that, you know they are studying it. You know they are checking their information. They know what they are doing. Either they are learning it, or they are the professor there that is behind them.

While this sentiment contradicts the heuristic that Web sites with .gov and .edu domains should be avoided due to the complexity of information provided, it suggests that—with proper attention to designing content specifically for the general public—universities do engender trust that can be leveraged in providing new interventions.

Given the importance of religion to many cultural groups, another idea prompted by the moderator was featuring a religious figure as an animated content provider. This idea was soundly rejected across all groups. One African American mother summed up a potential conflict of interest:

They start bringing their dogma into it. I just don't think I'd trust that.

The other major concern regarding religious figures as health providers was medical expertise. Receiving information from a medical expert within the religious community (e.g., a doctor from their parish) was viewed differently, however. One of the white fathers made this point strongly:

If it was a religious [medical person] I could understand that, but just plain average preacher, he ain't going to know jack about what you need to eat.

While tapping into religion might be a promising strategy for interpersonal or community interventions, it would appear this might be more challenging to achieve in the context of digital educational interventions.

## Discussion

E-health can revolutionize the way health information is provided to low-health-literate audiences, but that potential cannot be realized without understanding these individuals' needs and preferences. Participants accessed online health information and shared ideas about Internet use for common health concerns. Given the culturally diverse groups of parents involved, this work highlights broad issues and directions for improving research and practice in the education of low-health-literate audiences.

Perhaps the most important lesson is that while a Web site relying primarily on audiovisual content helps users with limited functional literacy, such a design can feel slow and simple to more literate users. New interventions designed to meet the needs of low-health-literate audiences should likely include several layers of content. The structure could provide basic content provided via audio and video with more complete textual content available for interested users with sufficient functional literacy.

In addition to layering content, usability concerns must drive design at several levels. The demonstration Web site shown during these focus groups featured simple navigational elements (VCR-style controls) and guided users through the content. For more sophisticated users, such a design is frustrating and cumbersome. Including a search feature, which might only benefit more advanced users, would be an easy way to meet their needs while keeping the basic structure in place for lower-literate audiences.

Other key insights regarding the design of interventions targeting lower-health-literate users include:

- Search engine optimization techniques (relevant page titles, alt tags on images, etc.) must be used to ensure that interventions are near the top of search results. Layering textual content beneath audiovisual information can help ensure search engines accurately index these interventions.
- Interventions designed to be used by parents and children together can provide new opportunities to teach both groups important health knowledge and technical skills, with the learning of parents and children reinforcing each other.
- Designers must be aware of comparisons between animated interventions and children's video games. Using graphical techniques such as rotoscoping could make it clear to users the application isn't intended to be on the cutting edge of graphics and animation.
- While people's personal or cultural ties to religion can be useful in promoting healthy behaviors in some contexts, this might be more challenging when offering health information to low-health-literate users via e-health interventions.

As noted earlier, participants had high health literacy as measured by the STOFHLA. While observing the focus groups, however, it was clear participants were unclear on the specifics of certain topics under discussion. The STOFHLA provides a quick measure of health literacy, but does not tap into more complex dimensions of health literacy such as scientific literacy or civic literacy.<sup>27</sup> New measures, providing a more nuanced assessment of health literacy, are necessary to improve research and practice.

Beyond concerns over measuring health literacy, limitations of the study are similar to any qualitative work: a smaller sample and less ability to generalize. The use of independent coders agreeing on the identification of key themes helps ensure the validity of these findings, but it is up to readers to apply or adapt research findings to other contexts as necessary.

Providing health information to low-health-literate audiences is a crucial issue, and e-health interventions have demonstrated significant potential in educating this important audience. It is important that researchers continue to explore low-health-literate users' needs and preferences for health information, and test new strategies for meeting these needs. This work represents a step forward in the development of e-health for low-health-literate populations, which should continue to grow as an important channel for reaching traditionally high-risk, hard to reach audiences. This is necessary to address both the obesity epidemic that was the context for this work and other public health crises facing low-health-literate populations around the world.

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## Disclosure Statement

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## REFERENCES

1. Ogden CL, Carroll MD, Curtin LR, McDowell MA, Tabak CJ, Flegal KM. Prevalence of overweight and obesity in the United States, 1999–2004. *JAMA* 2006;295:1549–1555.
2. Troiano RP, Flegal KM. Overweight children and adolescents: Description, epidemiology, and demographics. *Pediatrics* 1998;191:497–504.
3. Ogden CL, Carroll MD, Flegal KM. High body mass index for age among U.S. children and adolescents, 2003–2006. *JAMA* 2008;229:2401–2405.
4. Centers for Disease Control and Prevention. *Overweight and obesity: Defining overweight and obesity*. 2006. Available at: <http://www.cdc.gov/nccdphp/dnpa/obesity/defining.htm> (Last accessed December 12, 2006).



5. Brady LM, Lindquist CH, Herd SL, Goran MI. Comparison of children's dietary intake patterns with US dietary guidelines. *Br J Nutr* **2000**;84:361-367.
6. Anderson ES, Winett RA, Wojcik JR. Social-cognitive determinants of nutrition behavior among supermarket food shoppers: A structural equation analysis. *Health Psychol* **2000**;19:479-486.
7. Sobal J, Stunkard AJ. Socioeconomic status in obesity: A review of the literature. *Psychol Bull* **1989**;105:260-275.
8. Young KM, Northern JJ, Lister KM, Drummond JA, O'Brien WH. A meta-analysis of family-behavioral weight-loss treatments for children. *Clin Psychol Rev* **2007**;27:240-249.
9. Pew Internet and American Life Project. Internet activities. **2006**. Available at: [www.pewinternet.org/trends/Internet\\_Activities\\_4.26.06.htm](http://www.pewinternet.org/trends/Internet_Activities_4.26.06.htm) (Last accessed December 6, 2006).
10. Fox S. Online health search 2006. Washington, DC: Pew Internet & American Life Project, October 29, **2006**.
11. Eysenbach G. What is e-health? *J Med Internet Res* **2001**;3:e20.
12. Campbell M, Honess-Morreale L, Farrell D, Carbone E, Brasure M. A tailored multimedia nutrition education pilot program for low-income women receiving food assistance. *Health Educ Res* **1999**;14:257-267.
13. Oenema A, Brug J, Lechner L. Web-based tailored nutrition education: Results of a randomized controlled trial. *Health Educ Res* **2001**;16:647-660.
14. Tremayne M, Dunwoody S. Interactivity, information processing, and learning from the World Wide Web. *Sci Commun* **2001**;23:111-134.
15. Gustafson DH, McTavish F, Stengle W, et al. Use and impact of eHealth system by low-income women with breast cancer. *J Health Commun* **2005**;10:195-218.
16. Tessaro I, Rye S, Parker L, Mangone C, McCrone S. Effectiveness of a nutrition intervention with rural income women. *Am J Health Behav* **2007**;31:35-43.
17. Block G, Wakimoto P, Metz D, et al. A randomized trial of the little by little CD-ROM: Demonstrated effectiveness in increasing fruit and vegetable intake in a low-income Population. *Preventing Chronic Dis* **2004**;1:1-12.
18. McKay HG, King D, Eakin EG, Seeley JR, Glasgow RE. The Diabetes network Internet-based physical activity intervention. *Diabetes Care* **2001**;24:1328-1334.
19. Nielsen-Bohman L, Panzer A, Kindig D, eds. *Health literacy: A prescription to end confusion*. Washington, DC: National Academy of Sciences, **2004**.
20. Weiss BD. *Health literacy: A manual for clinicians*. Chicago, IL: American Medical Association Foundation, **2003**.
21. Whitten P, Love B, Buis L, Mackert M. Health education online for individuals with low health literacy: Evaluation of the Diabetes and You website. *J Technol Hum Services* **2008**;26:77-88.
22. Mackert M, Whitten P, Garcia A. Evaluating e-health interventions designed for low health literate audiences. *J Comp Mediated Commun* **2008**;13:504-515.
23. Mackert M, Love B, Whitten P. Patient education on mobile devices: An e-health intervention for low health literate audiences. *J Inf Sci* **2009**;35:82-93.
24. Baker D, Williams M, Parker R, Gazmarian J, Nurss J. Development of a brief test to measure functional health literacy. *Patient Educ Counseling* **1999**;38:33-42.
25. Parker RM, Baker DW, Williams MV, Nurss JR. The Test of Functional Health Literacy in Adults: A new instrument for measuring patients' literacy skills. *J Gen Intern Med* **1995**;10:537-541.
26. Nielsen Online. Web 2.0 for Pharma Marketers. **2008**. Available at: <http://nielsen-online.com/blog/tag/webmd/> (Last accessed January 26, 2009).
27. Zarcadoolas C, Pleasant A, Greer D. *Advancing health literacy: A framework for understanding and action*. San Francisco, CA: Jossey-Bass, **2006**.

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