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## A Pilot Study of Determinants of Ongoing Participation in EnhanceFitness, a Community-Based Group Exercise Program for Older Adults

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### Abstract

**Background and Purpose**—Physical activity has many benefits for older adults, but adherence is often low. The purposes of this study were to: 1) identify motivators and barriers for participation in EnhanceFitness (EF), a group-based exercise program; and 2) quantitatively examine the association between motivators, barriers and individual characteristics, and ongoing participation in the program.

**Methods**—This was a prospective, cross-sectional study. We mailed a pilot, investigator-developed survey to assess motivators and barriers to exercising to 340 adults who started a new EF class, regardless of their attendance rate. We pre-coded surveys based on class attendance, with former participants defined as having no attendance a month or more before a four-month fitness check.

**Results**—Of the 241 respondents (71% response rate), 61 (25%) were pre-coded as former participants and 180 (75%) as current participants. The mean age of respondents was 71 and they were predominately female (89%). More than half of respondents were Caucasian (58%), and

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almost half were married (46%). Former participants reported lower total motivation scores compared to current participants ( $p < 0.01$ ) and had a significantly higher mean total barrier score ( $p < 0.001$ ). The effects of 5 barriers (“Class was too hard,” “Class was too easy,” “I don’t like to exercise,” “Personal illness,” “Exercise caused pain”) and 2 motivators (“I want to exercise,” and “I plan exercise as part of my day”) were significantly different between current and former participants. Discrete event history models show dropout was related positively to ethnicity (Caucasians were more likely to drop out), and health-related barriers.

**Discussion**—In newly formed EF classes, participants who drop out report more program, psychosocial, and health barriers, and fewer program and psycho-social motivators. Total barrier score and health barriers significantly predict a participant’s dropping out, and Caucasian ethnicity is associated with a higher likelihood of dropping out.

**Conclusions**—Employing strategies that address health barriers to participation could improve attendance rates for group-based exercise programs.

### Keywords

EnhanceFitness; physical activity; motivation; barrier; group-based exercise program

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## INTRODUCTION

Demographers have estimated that the population of older adults (65 years) in the United States will double in the next 25 years.<sup>1</sup> By 2030, more than 60% of these adults will have two or more chronic conditions, such as diabetes, heart failure, arthritis, or dementia, that can lead to increased hospitalizations or nursing home stays.<sup>2</sup> Physical activity can improve the health and quality of life of older adults with chronic conditions.<sup>3</sup> However, in 2010 64.6% of older adults did not meet aerobic or muscle-strengthening activity recommendations set by the 2008 Federal Physical Activity Guidelines for Adults<sup>4</sup>. Of those 75 and older, the lack of participation increases to 70.3%. Overall, in 2010 more older adults met the aerobic recommendation (30.5% for those 65+, 23.9% for those 75+) than met the strengthening recommendation (15.4% and 12.3%, respectively).<sup>4</sup> Only 10.4% of those aged 65 and older met both recommendations, and this rate diminishes to 6.4% for those aged 75 and older.<sup>5</sup>

Physical activity has multiple benefits. It reduces the decline in basic and instrumental activities of daily living and mobility in the physically frail community-dwelling older adults.<sup>6-9</sup> In addition, physical activity reduces fear of falling and lowers fall risk.<sup>10-14</sup> It also improves strength, postural stability and flexibility, cardiopulmonary function, and mental health.<sup>15</sup> One way to help older adults follow the recommended levels of physical activity may be to encourage them to participate in group exercise programs. Group exercise programs have the potential to help older adults meet the recommended guidelines,<sup>16</sup> reduce falls,<sup>17</sup> and improve strength and mobility.<sup>18</sup>

EnhanceFitness (EF, formerly Lifetime Fitness) is an evidence- and community-based group exercise program for older adults at all levels of fitness, consisting of aerobic conditioning, strength training, and stretching.<sup>19</sup> Certified and trained fitness instructors lead the classes

which are offered three non-consecutive days a week. Every four months a functional test is conducted that measures participants' ability to complete vital actions of independent living that may be negatively impacted by aging-related frailty or loss of function (e.g., walking, climbing stairs, stooping/bending/kneeling). EF has been shown to reduce medical costs,<sup>20</sup> be cost-effective,<sup>21</sup> and help older adults maintain or improve their physical function,<sup>22,23</sup> including older adults in minority populations.<sup>24,25</sup> The program can be modified to meet the needs of participants with various levels of function, strength, and ability, and is currently offered in two versions, one where participants stand, and one where participants are seated. It is not known what reasons participants have for dropping out of a program whose design addresses differences in function, strength, and ability.

In studies involving exercise, adherence is typically conceptualized as the number of classes attended and reported in percentages, with non-adherers being categorized as those who fall below a certain percent of classes attended. Reasons for adherence and for non-adherence to exercise include *motivators* (i.e., experiences and perceptions that promote adherence) such as internal motivation, self-efficacy, knowledge, personality, goals,<sup>26</sup> supervision, and group support<sup>27</sup> as well as *barriers* (i.e., experiences and perceptions that limit participation) such as health, environment, lack of physician advice, and lack of knowledge regarding the relationship between exercise and health.<sup>28</sup> Kang et al. examined the reasons given for non-participation, which included convenience, transportation, other commitments, time limitations, time of class, weather, difficulty with exercise, concern of possible injuries, and cost.<sup>29</sup> Although the investigators ranked the reasons based on the prevalence of barriers, the generalizability of this study is limited by culture (Korean), sex (older women), and mode of exercise (aquatic). Schutzer and Graves reported that of those who drop out of exercise programs, the largest percentage do so within the first 6 months,<sup>28</sup> and Jancey et al. reported the largest percentage of dropouts occurred within the first 3 months of participating in the Perth Active Living Seniors program.<sup>30</sup> However, no study has been published that demonstrates the relationship between the time of dropout and various barriers for participation.

In this study we address these gaps in the literature by identifying motivators and barriers for participation in EF and by determining if identified motivators and barriers are predictive to dropping out.

## METHODS

### Design

This study is a prospective, cross-sectional study with a quantitative design.

### Participants

The study participants were members of EF classes across the United States. Participants were recruited via a postal mail solicitation from Senior Services, the organization that administers the EF program. To be included in the study, the individual had to have enrolled in an EF class that started between January 1, 2008 and June 16, 2008. We excluded participants who lived in retirement communities and participated in a new EF class on-site

due to differences in ease of access to EF classes. The University of Washington's (UW) Institutional Review Board approved the study. Informed consent was inferred by the return of the survey. We included 17 EF classes: 4 located in the Midwest, 3 in the West, and 10 in the Northeast (according to Census Bureau Regions), and mailed 340 eligible respondents a survey packet; nine were returned with incorrect address, and one was unusable because the identifying coding tag was removed by the respondent.

## Measures

We developed a 41-item pilot survey to collect information about motivators and barriers to participation in EF. The “motivator” and “barrier” concepts are related to the “perceived control” component of the Integrated Behavioral Model<sup>31,32</sup>. An initial search of PubMed and CINAHL using the search terms *older adult*, *exercise adherence*, and *compliance* resulted in few papers specific to community-based exercise programs for the general population of older adults.<sup>24,29,33</sup> These papers reported some reasons for non-adherence including program-related factors (cost, convenience, timing, group cohesion, and content), cognitive/ psychological factors (self-efficacy, loss of family), and environmental factors (weather, location, transportation). Given the existence of relatively few published studies on community-based exercise programs, we supplemented the survey with reasons for dropping out identified in the individual exercise literature.<sup>26-28,30,34-37</sup> Dominick and Morey<sup>38</sup> suggest factors associated with physical activity adherence can be placed in seven categories: demographic (e.g., age, gender, education), behavioral (e.g., smoking, alcohol use), health and biological (e.g., injury history, obesity), cognitive and psychological (e.g., enjoyment of exercise, intention to exercise), social (e.g., physician influence, social support from family or friends), program-related (e.g., exercise intensity and duration), and environmental (e.g., satisfaction with location, neighborhood safety). We supplemented the survey with factors from their list and adopted five of the seven categories for our survey, as detailed below.

We selected four older adults who were not involved in EF to review the survey for readability and comprehension. Additionally, four university researchers reviewed the survey design and ease of coding. The survey included seven demographic questions, four background questions, 12 motivators, and 20 barriers. A rated response was achieved using a 4-point Likert scale (0=“not at all” to 3=“very much”). The motivators were grouped in three categories (“Cognitive/ Psychological,” “Social,” and “Environmental”) and the barriers were grouped in five categories (“Cognitive/Psychological,” “Social,” “Environmental,” “Health”, and “Program”). They are presented in detail in Table 1. We did not calculate Cronbach's alpha in this case because there was no inherent reason for the items to be related to each other. We coded the surveys to indicate class location, the last month of class attended according to the attendance log, and percentage of classes attended.

## Procedures

To enroll in an EF class, participants go through a registration process, and sign in at every class. Participant information, including home address and attendance, is sent to the EF coordinator at Senior Services. We used a mailing strategy to maximize the number of respondents based on methods from a Cochrane Review,<sup>39</sup> including brown envelopes,

postage stamps versus metered stamps, and a monetary incentive of a \$2 bill. To maintain participant anonymity, the Senior Services EF coordinator (rather than the study investigators) mailed the surveys to eligible respondents, with a reminder postcard two weeks later. The coordinator mailed eligible respondents the study materials, which included a cover letter, the survey, a stamped, investigator-addressed return envelope, and the \$2 bill. The mailings were sent to eligible respondents four months after their first EF class, the point at which EF conducts voluntary fitness checks for participants. For instance, a participant who started attending EF classes in January 2008 was sent a survey in May 2008, whereas a participant who started EF in May 2008 was sent a survey in September 2008. Since Senior Services had already obtained the home address of each participant, recruitment into the study did not depend on the participant's current attendance of EF classes. We printed the seven-page survey in 16-point Times New Roman font for ease of reading by older adults. The time to complete the survey was estimated to be 10 minutes. The participants returned the surveys to the investigators at the University of Washington, who reviewed them for completion and entered the data into a statistical program (SPSS 16).

### Statistical Analyses

We began our analysis by generating descriptive statistics for the entire sample and then comparing the data from former and current participants. We calculated and compared motivator and barrier total scores between groups using a t-test with robust standard errors to account for the clustering of individuals from the 17 different classes. We recoded individual items, with responses "not at all" and "slightly" allocated to a "0" category and responses "moderately" and "very much" allocated to a "1" category. Participants' responses to these individual items were divided into two groups (former and current) for chi-square analysis of exercise motivators and barriers between groups.

We also explored the specific role of barriers on the likelihood of dropping out of the class over the 4-month period. Given the limited information on the timing of dropout, we used discrete event history models<sup>40,41</sup> to examine the relationship between program dropout and total barrier score and five specific barrier sub-scales ("Cognitive/Psychological," "Social," "Environmental," "Health", and "Program"). Like continuous time event history or hazard models, the discrete event history modeling approach estimates the hazard or probability of dropout associated with various independent predictor variables for those exposed to the risk of dropout. The discrete formulation was preferable to the continuous time model in this study because only the month of dropout was known, rather than more precise time intervals such as week or exact date of dropout. In all models, we controlled for the education level (less than high school, high school to some post-high school training, college degree or more), gender, ethnicity (Caucasian, non-Caucasian), and whether the individual lived alone (versus other household arrangements). In all models, we used robust standard errors to account for the clustering across classes.

Throughout all analyses we used regression imputation to estimate missing data; individual items were assessed with the observed N. All scales were at least 95% populated across the sample. Prior to imputation we set the level of significance at  $\alpha = .05$ . The data was analyzed using SPSS 16.0 and STATA 10.0.

## RESULTS

Survey response rate was 70.9% (n=241), and all valid returned surveys were included. Several respondents returned the \$2 bill (6), with three stating that the denomination was bad luck. The mean age of respondents was 71 and they were predominately female (89%); more than half were Caucasian (58%); almost half were married (46%); more than half had at least some college (57%); and 41% had an income of less than \$25,000 (Table 2). By the time they received the survey, 25% of respondents had stopped attending the program. We refer to them as “former participants” in the remainder of this manuscript, and use the term “current participants” to refer to the 75% of respondents who were still enrolled at the time of the survey. For the No significant differences in demographics former participants, 19% did not attend after the first month, 38% did not attend after the second month, and 19% did not attend after the third month. were found in comparing the two groups.

We calculated total scores for both motivators and barriers, and found significant differences between current and former participants; current participants scored higher on motivators (28.8 vs 26.4,  $p < .01$ ) and perceived fewer barriers (4.10 vs 7.67,  $p < .001$ ) (see Tables 3 and 4). We also compared individual items between groups. Our analyses identified three significant differences in the proportions of current versus former participants endorsing the following motivators: “I want to exercise” (.96 vs .82,  $p < .001$ ), “I plan exercise as part of my day” (.84 vs .70,  $p < .001$ ), and “I like the facilities at the class” (.97 vs .91,  $p < .05$ ). Compared to former participants, current participants were less likely to endorse the following barriers: “Class was too hard” (.03 vs .19,  $p < .001$ ), “Class was too easy” (.07 vs .23,  $p < .001$ ), “I don’t like to exercise” (.07 vs .24,  $p < .001$ ), “Personal illness/poor health” (.14 vs .25,  $p < .05$ ); and 5), and “Exercise caused pain” (.06 vs .22,  $p < .001$ ).

Table 5 shows the results of the discrete event history models for dropping out from the exercise program. Model 1 relates 5 demographic characteristics to dropout; none are significant. Model 2 includes the total barrier score and shows that an increase in barriers endorsed leads to a 12% increase in the odds (odds ratio (OR) 1.122  $p = .02$ ) of dropping out of the program, controlling for demographic characteristics. Model 2 also demonstrates that, net of total barriers, Caucasians are twice as likely to drop out compared to non-Caucasians (OR 2.021  $p = .03$ ). Model 3 replaces the total barrier score with the five specific barrier subscales. In this model, net of the demographic factors and other endorsed barriers, the subscale “Health barriers” is the only barrier associated with a higher likelihood of dropping out (OR 1.591  $p < .001$ ). “Program barriers” (net of other endorsed barriers) are approaching significance at  $p = .08$  with an OR of 1.586. Additionally, Model 3 demonstrates Caucasians may be more likely to drop out of EF after accounting for various endorsed barriers (OR = 2.115,  $p = .02$ ). (We also used a variant of Model 3 where we included the barriers one at a time to see whether any of them were related to dropout. This analysis revealed that each barrier alone was significantly related to dropout from EF (results not shown). However, as Model 3 shows, net of all other barriers, health-related barriers are the only barriers significantly related to dropout.)



## DISCUSSION

The majority of participants in our study (75%), continued to participate in EF classes. The high percentage of women in the study was expected, as 84.2% of all EF participants that enrolled between 2006 and 2009 were women<sup>42</sup>. The demographic data we collected from former and current participants in this study were comparable and is shown to have no significant impact on the rate of dropout from EF. However, in the multivariate model of dropout, being Caucasian (versus non-Caucasian) was associated with a significantly greater likelihood of dropping out; this distinction in participation by race was revealed when we controlled for barriers to participation.

In this study, the total barrier scale and the total motivator score were both associated with dropping out; current participants endorsed fewer barriers and had more sources of motivation. The results of this study indicate three distinguishing motivators between former and current participants: intending to exercise, having an overall positive view of exercising, and liking the facilities where the exercise class is being offered.

Former participants were significantly more likely to endorse five barriers to attendance when compared to current participants. The first two barriers, “Class was too hard” and “Class was too easy,” are program-related items. The third barrier, “I don’t like to exercise” is of a cognitive-psychological nature. The fourth and fifth barriers, “Personal illness” and “Exercise causes pain,” are health-related items. Of the items endorsed as barriers, the program and health-related items could conceivably be directly addressed by either instructor training or participant education. While the training curriculum for EF instructors includes techniques for modifying the difficulty of exercises depending on participant health status<sup>43</sup>, it may require repetition for the instructors to convey the message in an appropriate way and at the right time for the participant, and for the participant to understand and apply the knowledge. Viable explanations for participant perception of class being “too hard” include pain and poor health. Participant instruction on adjusting exercises based on level of ability may help in reducing these barriers and encourage continued participation. Barriers in general appear to be associated with a participant’s decision whether or not to continue in an EF exercise program. The total barrier score is positively related to dropping out, and when the total score is broken into its components, there is support for physical health, cognitive/psychological, and program factors being related to continued program participation. Additionally, the results of this study indicate some contrast in the rate of dropout from EF programs by Caucasians and non-Caucasians. This observation warrants further exploration, as it may have applicability in other community-based exercise programs.

The findings must be considered within the context of the study limitations. One limitation is that these findings may apply only to newly formed exercise groups. Those joining or attending existing classes may report different barriers and motivators than those joining a new class. Second, this study did not control for instructor experience in leading group-exercise classes. In future studies, it would be advantageous to capture the experience level of the EF instructors. Third, the delay in mailing of the attendance rosters from some sites to Senior Services, which resulted in later mailing of surveys (average 53.7 days, range 19-93 days), may have resulted in recall bias. And last, these preliminary results are based on a

pilot implementation of the survey instrument, and therefore more testing is necessary to eliminate or refine potentially ambiguous questions or statements.

Possible ways for community exercise programs to reduce the percentage of those who drop out of the program include training instructors on ways to improve participants' view of exercise as enjoyable and how to adjust the exercise routine for participants if they find the program too hard, too easy or causes pain or fatigue.<sup>44</sup> Organizations offering the program may also want to assess what participants like and do not like about the program location and facilities as well as have an experienced instructor or staff member review new instructors' style to ensure optimal interactions between instructors and participants.

## CONCLUSION

In summary, this study suggests EF participants who stay in new EF community-based programs have fewer exercise barriers and have more sources of motivation, especially when considering cognitive/psychological and environmental factors. Those who drop out report more barriers that stem from health- and program-related factors. In order to improve participation in community-based group exercise programs, it may be beneficial for organizers to focus on addressing participants' views of exercise and train instructors to adapt routines as needed within the limits of the EF protocol.

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**Table 1**

Survey items capturing motivators and barriers to participation in EnhanceFitness.

Motivator Category	Item
Cognitive/Psychological motivators	I enjoy exercise
	I exercise to improve my health
	I plan exercise as part of my day
	I want to exercise
	I am healthy enough to exercise
Social motivators	My doctor encourages me to exercise
	My family encourages me to exercise
	My friends encourage me to exercise
	I get along well with those in the class
Environmental motivators	I can get to the class easily
	I like the facilities at the class
	The class is in a safe part of town
Barrier Category	Item
Cognitive/Psychological barriers	I don't have time to exercise
	I don't like to exercise
	I don't like to wear exercise clothes
Social barriers	I had a conflict with another classmate
	Family member illness
	Loss of a loved one
Environmental barriers	I had problems with transportation
	Weather (hot, cold, rainy)
	I moved away from the area
	The class is in a part of town that is not safe
Health barriers	Personal illness/ poor health
	My doctor told me to stop exercising
	I became too tired
	Exercises caused pain
Program barriers	Time of class inconvenient
	The class occurred too frequently
	Class was too hard
	Class was too long
	Class was too easy
	Instructor was not any good

**Table 2**

Demographics of Respondents (n, %)

<b>Variable</b>	<b>All Participants (N=241)</b>	<b>Former Participants (N=61)</b>	<b>Current Participants (N=180)</b>	<b>P-value for difference between current and former participants</b>
Age (Mean, SD)	71.2 8 (8.23)	71.1 (7.99)	71.3 (8.31)	0.89
Size of household (Mean, SD)	1.7(0.87)	1.8 (1.03)	1.7 (0.81)	0.50
Female	215 (89.2)	53 (86.9)	162 (90.0)	0.88
Caucasian	141 (58.5)	42 (68.8)	99 (55.0)	0.59
Married	110 (45.6)	23 (37.7)	87 (48.3)	0.16
At least some college	139 (57.6)	39 (63.9)	100 (55.5)	0.60
Income – <\$25K/ year	98 (40.7)	20 (32.8)	78 (43.3)	0.07

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**Table 3**

Comparing Motivators: Former versus Current Participants

Motivator Category	Item	Proportion of <b>current</b> participants endorsing the item	Proportion of <b>former</b> participant endorsing the item	p-value for difference <sup>a</sup>
CognitivePsychological motivators	I enjoy exercise	.93	.86	0.06
	I exercise to improve my health	.97	.93	0.09
	I plan exercise as part of my day	<b>.84</b>	<b>.70</b>	<b>0.00</b>
	I want to exercise	<b>.96</b>	<b>.82</b>	<b>0.00</b>
	I am healthy enough to exercise	.96	.94	0.48
Social motivators	My doctor encourages me to exercise	.82	.90	0.20
	My family encourages me to exercise	.73	.76	0.50
	My friends encourage me to exercise	.64	.63	0.75
	I get along well with those in the class	.99	.96	0.19
Environmental motivators	I can get to the class easily	.97	.92	0.28
	I like the facilities at the class	<b>.97</b>	<b>.91</b>	<b>0.03</b>
	The class is in a safe part of town	.98	.96	0.15
Total motivator score (Mean, SD) <sup>b</sup>		<b>28.8 (5.82)</b>	<b>26.4 (6.35)</b>	<b>0.01</b>

<sup>a</sup>based on robust standard errors;

<sup>b</sup>total possible points for Motivators = 36

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**Table 4**

Comparing Barriers: Former versus Current Participants

Barrier Category	Item	Proportion of <b>current</b> participants endorsing the item	Proportion of <b>former</b> participant endorsing the item	p-value for difference <sup>a</sup>
Program barriers	Time of class inconvenient	.17	.25	0.21
	The class occurred too frequently	.05	.11	0.08
	Class was too hard	<b>.03</b>	<b>.19</b>	<b>0.00</b>
	Class was too long	.03	.07	0.11
	Class was too easy	<b>.07</b>	<b>.23</b>	<b>0.00</b>
	Instructor was not any good	.05	.17	0.08
Cognitive/Psychological barriers	I don't have time to exercise	.11	.14	0.45
	I don't like to exercise	<b>.07</b>	<b>.24</b>	<b>0.00</b>
	I don't like to wear exercise clothes	.08	.06	0.67
Social barriers	I had a conflict with another classmate	.00	.02	----
	Family member illness	.10	.06	0.42
	Loss of a loved one	.01	.06	0.06
Environmental barriers	I had problems with transportation	.04	.02	0.47
	Weather (hot, cold, rainy)	.08	.06	0.68
	I moved away from the area	.01	.02	0.46
	The class is in a part of town that is not safe	.03	.02	0.62
Health barriers	Personal illness/ poor health	<b>.14</b>	<b>.25</b>	<b>0.05</b>
	My doctor told me to stop exercising	.02	.04	0.13
	I became too tired	.05	.15	0.07
	Exercises caused pain	<b>.06</b>	<b>.22</b>	<b>0.00</b>
Program barriers	Time of class inconvenient	.17	.25	0.21
	The class occurred too frequently	.05	.11	0.08
	Class was too hard	<b>.03</b>	<b>.19</b>	<b>0.00</b>
	Class was too long	.03	.07	0.11
	Class was too easy	<b>.07</b>	<b>.23</b>	<b>0.00</b>
	Instructor was not any good	.05	.17	0.08
Total barrier score (Mean, SD) <sup>b</sup>		<b>4.10 (4.40)</b>	<b>7.67 (5.83)</b>	0.00

<sup>a</sup> based on robust standard errors;

<sup>b</sup> total possible points for Barriers = 78



**Table 5**

Results of discrete event history models predicting the likelihood of dropping out of the program.

Variable	Model 1		Model 2		Model 3	
	OR (s.e.)	p-value <sup>a</sup>	OR (s.e.)	p-value <sup>a</sup>	OR (s.e.)	p-value <sup>a</sup>
Female	1.010(.42)	.98	1.080(.52)	.87	1.10 (1.47)	.82
HS education	.916(.48)	.86	1.085(.65)	.89	.977 (.55)	.96
College education	1.095(.55)	.85	1.032(.58)	.95	.998 (.54)	.99
Live alone	1.322(.44)	.39	1.454(.46)	.24	1.538 (.49)	.18
Caucasian	1.664(.57)	.13	<b>2.021(.68)</b>	<b>.03</b>	<b>2.115 (.70)</b>	<b>.02</b>
Total barriers score	-----	-----	<b>1.122(.02)</b>	<b>.00</b>	-----	-----
Program barriers	-----	-----	-----	-----	1.586 (.42)	.08
Environment barriers	-----	-----	-----	-----	.646 (.27)	.31
Cognitive barriers	-----	-----	-----	-----	.918 (.35)	.82
Social barriers	-----	-----	-----	-----	1.003 (.54)	.99
Health barriers	-----	-----	-----	-----	<b>1.591 (.19)</b>	<b>.00</b>
Wald chi	(5) = 3.3 p = .64		(6) = 32.9 p < .001		(10) = 38.9 p < .001	

<sup>a</sup> based on robust standard errors

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