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## Sociodemographic, Clinical and Psychological Factors Associated with Attrition in a Prospective Study of Cardiovascular Prevention: The Heart Strategies Concentrating on Risk Evaluation (Heart SCORE) Study

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### Abstract

**Purpose**—To identify factors associated with attrition in a longitudinal study of cardiovascular prevention.

**Methods**—Demographic, clinical and psychosocial variables potentially associated with attrition were investigated in 1,841 subjects enrolled in the southwestern Pennsylvania Heart Strategies Concentrating on Risk Evaluation study. Attrition was defined as study withdrawal, loss to follow-up, or missing 50% of study visits.

**Results**—Over four years of follow up, 291 subjects (15.8%) met criteria for attrition. In multivariable regression models, factors that were independently associated with attrition were: Black race (Odds Ratio(OR):2.21, 95% Confidence Interval(CI):1.55, 3.16;  $P<0.001$ ), younger age (OR per 5-year increment:0.88, 95% CI:0.79, 0.99;  $P<0.05$ ), male sex (OR: 1.79, 95% CI: 1.27, 2.54;  $P<0.05$ ), no health insurance (OR:2.04, 95% CI:1.20, 3.47;  $P<0.05$ ), obesity (OR:1.80, 95% CI:1.07, 3.02;  $P<0.05$ ), CES-D depression score 16 (OR:2.02, 95% CI:1.29, 3.19;  $P<0.05$ ), higher ongoing life events questionnaire score (OR=1.09, 95% CI= 1.04–1.13;  $P<0.001$ ). Having a spouse/partner participating in the study was associated with lower odds of attrition (OR=0.60 95% CI=0.37–0.97;  $P<0.05$ ). A synergistic interaction was identified between black race and depression.

**Conclusions**—Attrition over four years was influenced by sociodemographic, clinical and psychological factors that can be readily identified at study entry. Recruitment and retention

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strategies targeting these factors may improve participant follow-up in longitudinal cardiovascular prevention studies.

### MeSH headings

Cardiovascular Diseases; Cohort Studies; Lost to Follow-Up

Results from longitudinal cohort studies of cardiovascular disease (CVD) have contributed to the decline in age-standardized CVD mortality rates. Decreasing subject participation and retention rates in cohort studies, which have been occurring over the past several decades<sup>1-3</sup>, may compromise the integrity of study results by negatively impacting biases of results, statistical power, and generalizability of findings<sup>4-6</sup>. Participant loss to follow-up (LTFU) and missing study visits are inevitable and are related to length of follow-up and complexity of study protocols<sup>7</sup>.

Researchers have been encouraged to report their study's retention strategies and identify factors that influence subject retention<sup>6,8-10</sup>. Nevertheless, little information exists about associations of demographic, clinical and psychosocial factors, both individually and in combination, on study attrition. This is particularly relevant to investigations that include underrepresented populations such as minorities and women<sup>11-13</sup>. Furthermore, the expense of conducting health care research, low percentages of individuals who enroll in studies and potential risks to subjects make systematic efforts to reduce study attrition an important priority<sup>9, 14</sup>. Our study aimed to identify characteristics associated with attrition in a middle-age cohort of 1,841 subjects in the Heart Strategies Concentrating on Risk Evaluation (Heart SCORE) study.

## METHODS

Heart SCORE is an ongoing study of 2,000 middle aged whites and blacks in southwestern Pennsylvania.<sup>15</sup> Heart SCORE aims to improve risk stratification, identify racial disparities and evaluate mechanisms for population differences in CVD. After a baseline evaluation, subjects underwent annual visits which included measurements of traditional and emerging CVD risk factors, tabulation of adverse events and assessments of subclinical atherosclerosis. The present analysis was confined to 1,841 subjects (92% of cohort). Sixty-seven subjects who self-reported race other than black or white were not included because the number of participants in these categories was too small for a meaningful analysis. Participants known to be deceased (n=34) and those in the window for their 4-year visits at the time of analysis (n=58) were excluded in order to accurately evaluate the occurrence of attrition over 4 years. All subjects provided written informed consent approved by the University of Pittsburgh Institutional Review Board.

### Data collection

Age, race, sex, education level, annual income and health insurance status were obtained by self-report at baseline. Race was self-identified as "Black or African American", "White", "Asian", "American Indian or Native Alaskan", "Native Hawaiian or Pacific Islander", "Other". Education was categorized as "some college or higher" or "less than college". Annual income was reported as: "<\$10,000", "10,000-<\$20,000", "\$20,000-<\$40,000", "\$40,000-<\$80,000" and "\$80,000". Subjects self-reported any history of CVD (coronary heart disease, heart failure, stroke) and other chronic conditions. At baseline, subjects completed psychosocial scales, including the Center for Epidemiologic Studies Depression Scale (CES-D)<sup>16</sup>, Cook-Medley Hostility Scale (CMHI)<sup>17</sup>, State-Trait Anger Inventory (STAI anger)<sup>18</sup>, State-Trait Anxiety Inventory (STAI anxiety)<sup>19</sup>, Cohen Perceived Stress Scale<sup>20</sup>, Unfair Treatment Scale<sup>21</sup>, Ongoing Life Events Score (OLE)<sup>22</sup>, Life Orientation

Test (LOT) <sup>23</sup>, Life Engagement Score (LES) <sup>24</sup> and Social Network Index <sup>25</sup>. Measurements including weight, height, waist circumference and blood pressure were performed at baseline and annually. Fasting venous blood was drawn annually to measure lipids, and glucose. Study coordinators recorded any difficulties with phlebotomy.

### Study Recruitment

Subjects were recruited through mass mailings, advertisements and referrals from the general community, other participants, and physicians. Minority recruitment was enriched through community-based health screening events conducted in partnership with the Pittsburgh Theological Seminary and Urban League of Greater Pittsburgh. Subjects recruited at community events, in physician offices, through community sources, or by other participants were considered “proactively” recruited, in contrast to those who were recruited through mass mailings or advertisements.

### Retention strategies

Multiple strategies are used to maximize retention and timeliness of follow-up visits: (1) *Subject contact and scheduling*- the University of Pittsburgh Graduate School of Public Health call center schedules annual visits. A reminder letter is sent five weeks before the subject’s scheduled follow-up visit; phone calls are made one week and one day prior to visits. During these calls, contact information is updated and subjects are instructed to complete annual questionnaires. (2) *Annual study visit*- Annual visits (~45 minutes) include a limited physical examination and blood specimen collection. Subjects are offered nutritional counseling. Beverages and parking validation are provided. (3) *Educational benefits*- semi-annual newsletters are mailed to provide information about CVD topics, results of analyses, examples of subject experiences implementing lifestyle changes, and healthy recipes. Educational seminars are offered twice yearly. (4) *Other research opportunities*- Ancillary studies are periodically offered. For example, subjects were given an opportunity to enroll in a study of a portable home monitoring to investigate the link between sleep apnea and CVD. (5) *Missed visits and disenrollment procedures*- when a subject misses a visit, call center staff initiate repeated attempts at telephone contact until the subject is reached and the visit is rescheduled. If phone contact is unsuccessful, a letter is mailed to ask the subject to call the scheduling office. A Pennsylvania Department of Health database is searched periodically to query vital status on subjects who fail to respond to this letter. If a subject is not identified as deceased, his/her secondary contacts are called to request that the subject contact the study office. Subjects who fail to complete an annual visit are given a 6-month window to show up or complete a mailing package. “Off-study” forms are completed for subjects who withdraw from the study.

### Definition of attrition variables

A “missed visit” is assigned when a subject does not show up or return the mailing package corresponding to his/ her annual visit within the expected date plus a 6-month window but is subsequently seen or returns mailing information. Subjects who fail to show up for their visit and do not return mailings for their last three annual visits for any reason other than death are classified as “lost to follow-up” (LTFU). Two categories of study subjects were defined: (1) “Attrition group,” which included LTFU, subjects who withdrew from the study and those who missed 2 of 4 annual visits; (2) “Stayers,” which is the complement of attrition (i.e., subjects who missed zero or one annual visit).

### Statistical analyses

Baseline characteristics were compared between stayers and the attrition group. Continuous variables were described by means(standard deviations) and compared by *t*-tests.

Categorical variables were described by percentages and compared by chi-square tests. Univariable logistic regression models were used to assess the association between baseline demographic, clinical and psychosocial variables and study attrition. Variables that had  $P$ -values  $< 0.10$  and those judged to be clinically relevant were included in multivariable models. Multiplicative and additive interactions between the significant predictors of attrition were explored. Multiplicative terms were included in the models and three measures for additive interaction and their 95% Confidence intervals (CI) were calculated<sup>26</sup>: relative excess risk of interaction (RERI), attributable proportion of interaction, and synergy index. If there are no interactions, RERI and the attributable proportions of interaction are both 0 and the synergy index is 1. All data analyses were performed using SPSS statistical package version 19.0 (SPSS, Inc., Chicago, IL). Two-sided  $P$ -values  $< .05$  were considered statistically significant.

## RESULTS

### Demographic characteristics

Analyses were confined to 1,841 subjects who self-reported race as either black (43%) or white and who completed the timeframe for their 4-year follow-up visit. Baseline characteristics are presented in Table 1. Mean age was  $59.1 \pm 7.5$  years and 73.4% of subjects were  $< 65$  years old. A majority of individuals (81.4%) had at least some college education and 57.7% had at least an associate degree. More than half reported an annual income  $\$40,000$  and 20.1% reported an annual income  $\$80,000$ .

Figure 1 depicts the distribution of subjects according to categories of retention and illustrates that 1,351 (73.4%) subjects had complete data (i.e., no missed visits) and 199 (10.8%) missed only one visit over four years. Sixty-nine (3.7%), 79 (4.3%), and 143 (7.8%) subjects withdrew, were LTFU, and missed 50% of their annual visits, respectively. In total, 291 subjects (15.8%) met the definition of study attrition.

As shown in Table 1, in comparison with stayers ( $n=1,550$ ), the 291 individuals in the attrition group were younger [ $57.7(7.9)$  versus  $59.4(7.4)$  years;  $P < 0.001$ ], more likely to be black (61.9% versus 39.5%;  $P < 0.001$ ), and had a higher mean body mass index (BMI) [ $31.9(7.2)$  versus  $29.8(6.1)$  kg/m<sup>2</sup>;  $P < 0.001$ ]. The attrition group had a significantly greater percentage of individuals who reported income  $< \$40,000$  (56.4% versus 43.5%;  $P < 0.001$ ) and were uninsured (11.5% versus 4.4%,  $P < 0.001$ ). The percentage of subjects who had a spouse or partner participating in the study was significantly lower in the attrition group (16.5 versus 27.4%,  $P < 0.001$ ). Having been “proactively recruited” for the study was more frequent among those in the attrition group (36.7% versus 29.9%,  $P = 0.02$ ). The percentage of subjects who reported any difficulty or discomfort during phlebotomy at their baseline visit was nominally higher in the attrition group (20.9% versus 16%,  $P = 0.05$ ).

### Psychosocial variables

Table 2 shows the percentage of individuals with a CES-D score  $\geq 16$ , which is indicative of at least mild depression<sup>27</sup>, as well as mean scores for continuous psychosocial scales by categories of retention. Subjects in the study attrition group had significantly higher scores on depression, hostility, anger, anxiety, stress, unfair treatment, OLE and LOT scales. Life engagement (purpose in life) and social network (diversity and number of social contacts) scores were similar between the two groups. Additional analyses showed that black race was significantly associated with higher scores for depression, hostility, unfair treatment and ongoing life events (data not shown).

## Uni- and multivariable analyses

Socio-demographic and clinical characteristics found to be significantly associated with study attrition in univariable logistic regression models were: Black race, younger age, annual income <\$20,000, no health insurance, working status other than currently working or retired, not living with spouse/partner, not having a spouse/partner in the study, proactively recruited, obesity (BMI  $\geq 30$  kg/m<sup>2</sup>) and difficulty during phlebotomy at baseline study visit. The percentage of subjects with  $\geq 3$  chronic medical conditions was not significantly higher for the attrition group (29.4% versus 24.8%,  $P=0.13$ ). With the exception of life engagement score and social network variables, all studied psychological variables were univariably associated with attrition.

Multivariable logistic regression models identified black race, no health insurance, male sex, obesity, and a CES-D  $\geq 16$  as the strongest factors independently associated with attrition (Table 3). Having a spouse/partner in the study was independently associated with a lower odds of attrition after adjusting for demographic, clinical and psychosocial variables (Odds Ratio(OR):0.60, 95%CI: 0.37, 0.97;  $P=0.04$ ). Marital status did not play a confounding role on the association between having a spouse/partner in the study and attrition (data not shown). Having been proactively recruited for the study was associated with attrition after adjusting for race, age, sex, health insurance status and body weight status (Models 1 and 2, Table 3), but this was not significant in the presence of psychological predictors (Model 3, Table 3). In comparison with whites and after adjustment for age, sex, health insurance status, having spouse/partner in the study, recruitment strategy, body weight status, depression score and OLE score, blacks had more than twice the odds of study attrition (OR: 2.21, 95%CI:1.55, 3.16;  $P<0.001$ ). Being obese conferred 80% higher odds of study attrition in the fully adjusted model. Additional analyses indicated that each kg/m<sup>2</sup> of BMI was associated with an estimated 3% increase in the odds of study attrition (OR: 1.03, 95%CI: 1.01, 1.06;  $P=0.004$ ). Not having health insurance and a CES-D score  $\geq 16$  were independently associated with two-fold odds for attrition. Education and income levels were not independent predictors of attrition.

## Interactions among variables

Compared with whites with a CES-D score <16, study attrition was significantly higher in blacks and subjects with a CES-D  $\geq 16$ . After adjustment for other predictors, the 3 interaction measures on the additive scale showed significantly higher values than the null (RERI:3.29, 95%CI:0.46, 6.12; attributable proportion of interaction:0.63, 95%CI:0.37, 0.88; synergy index:4.37, 95%CI:1.31, 14.57), indicating a synergistic association of black race and depression on study attrition (Figure 2). Additive interactions between race and sex, health insurance status and obesity were explored, but no significant interactions were found. All multiplicative interaction terms including race, sex, health insurance status, obesity and CES-D score failed to reach statistical significance in multivariable models.

## DISCUSSION

The Heart SCORE study of CVD risk enrolled 2,000 subjects in southwestern Pennsylvania. Over four years of follow up, we found that study attrition was highest among blacks, males, younger individuals, subjects without health insurance, obese subjects, and those with at least mild depression or a higher ongoing life events score. Having a spouse/partner participating in the study was associated with lower study attrition.

Our findings indicate that study attrition is a nonrandom event that is dependent on characteristics that can be readily identified at study entry. This concept has important implications on the design and analyses of other research studies. For example, our finding



that black race is a strong independent predictor of attrition should prompt investigators to consider novel and culturally-sensitive methods to over-recruit and retain blacks in observational studies. Targeted strategies can address reported observations that blacks, as compared to whites, have a lower perceived benefit of study participation<sup>28</sup> and place a lower priority on health promotion and disease prevention<sup>29</sup>. Other addressable issues are transportation difficulties, inconvenient clinic hours, challenges related to literacy levels, lost wages, family concerns about research and child-care difficulties<sup>30</sup>. Investigators can also dispel the belief that researchers are more interested in research than in patient well-being<sup>30,31</sup>.

Similar considerations should be given to males and younger individuals, who were more likely to be in our “study attrition” group. These findings are consistent with reports indicating that younger age is associated with higher loss to follow-up, which may be explained by greater geographical mobility among younger study subjects<sup>32,33</sup>. Younger individuals may also perceive less disease susceptibility and less benefit from ongoing participation in long-term studies. Similar concepts may explain our finding that being proactively recruited was associated with higher attrition. In contrast, individuals who were recruited through mailings or advertisements were more likely to be retained, indicating that these methods may recruit a group with less geographic mobility and greater self-interest in and commitment to long-term participation in protocols.

New retention strategies can capitalize on other noted observations. Obesity emerged as a strong independent predictor of study attrition. Given the increasing prevalence of obesity and the importance of enrolling obese patients in CVD study cohorts, study designs should consider retention methods that are relevant to obese individuals such as providing transportation and addressing co-morbidities that may preclude long-term study commitment. In contrast, our finding that having a spouse/partner who was a study subject was independently associated with a lower rate of attrition needs to be interpreted cautiously. While this might be used as a marker for lower risk of attrition, we do not suggest the enrollment of couples in longitudinal research studies as a strategy to improve retention, since this might reduce independence of observations, thus creating biases and analytic complexity.

We initially postulated that a lack of health insurance would be associated with increased study retention because participation in Heart SCORE provided regular CVD risk assessments at no cost to subjects. However, our results demonstrated that a lack of health insurance was associated with increased attrition, which has been previously reported in prevention-oriented research studies<sup>30,34</sup>. Being uninsured remained a significant predictor of attrition even after adjustment for relevant demographic, clinical, and psychosocial factors, which reinforces the application of this easily obtainable information as a risk marker for study attrition.

To the best of our knowledge, ours is the first study to examine the association between a comprehensive set of psychosocial variables and attrition in a cardiovascular prevention cohort study. Ongoing life events and depression were significant independent predictors of attrition. Ongoing life events score is indicative of subject’s life changes and has been associated with the development of chronic diseases, including CVD<sup>35</sup>. Our observation that subjects with depression symptoms had increased odds of attrition is consistent with the literature<sup>36,37</sup>. Providing psychological counseling or referrals for depression treatment might be considered a novel strategy to improve retention. Furthermore, our study identified an additive synergistic interaction between black race and a CES-D score  $\geq 16$  on study attrition. It has been argued that interaction on an additive scale is more meaningful than that on a multiplicative scale for assessing biologic significance of associations and is more

relevant to disease prevention and intervention<sup>38,39</sup>. From a study design perspective, the identification of the joint association of black race and depression on attrition provides insight into characterization of a subset of individuals with disproportionately high risk for study withdrawal, loss to follow-up, or missing data and who may benefit from targeted retention strategies.

## Limitations

First, our findings from an urban-based study of racial disparities of CVD in Southwestern Pennsylvania may not generalize to cohorts with different socio-demographic characteristics or from different geographic regions. Second, we employed an array of retention strategies across different themes<sup>9</sup>, resulting in a high percentage of subjects with complete data or having missed only one study visit over 4 years. This may limit the application of our findings to other studies with higher attrition rates. Third, the small number of individuals who withdrew from our study or who were LTFU precluded analysis of individual components of our definition of attrition. Fourth, identified predictors of attrition, such as race, may be surrogates for unmeasured factors (e.g., perceived benefit of study participation, mistrust of research studies)<sup>30,40</sup>. Fifth, our results may not apply to clinical trials, which may entail more frequent contact with trial subjects. Finally, our analyses examined study attrition after four years of follow-up. CVD studies, especially those investigating primary prevention, frequently require longer-term follow-up. However, our results are relevant to longer-term studies because attrition is generally highest during the early follow-up intervals<sup>41</sup>.

## Conclusions

Sociodemographic, clinical and psychological factors associated with attrition from a CVD prevention study were identified. These factors can be used to inform enrollment goals, subject recruitment methods and novel targeted retention efforts for other longitudinal CVD studies. Further investigations are required to assess the influence of the factors reported in our study over longer follow-up periods and the effectiveness of new retention strategies that incorporate these factors.

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## List of abbreviations

<b>BMI</b>	Body mass index
<b>CI</b>	Confidence interval
<b>CES-D</b>	Center for Epidemiologic Studies Depression Scale
<b>CMHI</b>	Cook-Medley Hostility Scale
<b>CVD</b>	Cardiovascular disease
<b>Heart SCORE</b>	Heart Strategies Concentrating on Risk Evaluation

<b>LES</b>	Life Engagement Score
<b>LOT</b>	Life Orientation Test
<b>LTFU</b>	Loss to follow-up
<b>OLE</b>	Ongoing Life Events Score
<b>OR</b>	Odds ratio
<b>RERI</b>	Relative excess risk of interaction
<b>STAI anger</b>	State-Trait Anger Inventory
<b>STAI anxiety</b>	State-Trait Anxiety Inventory

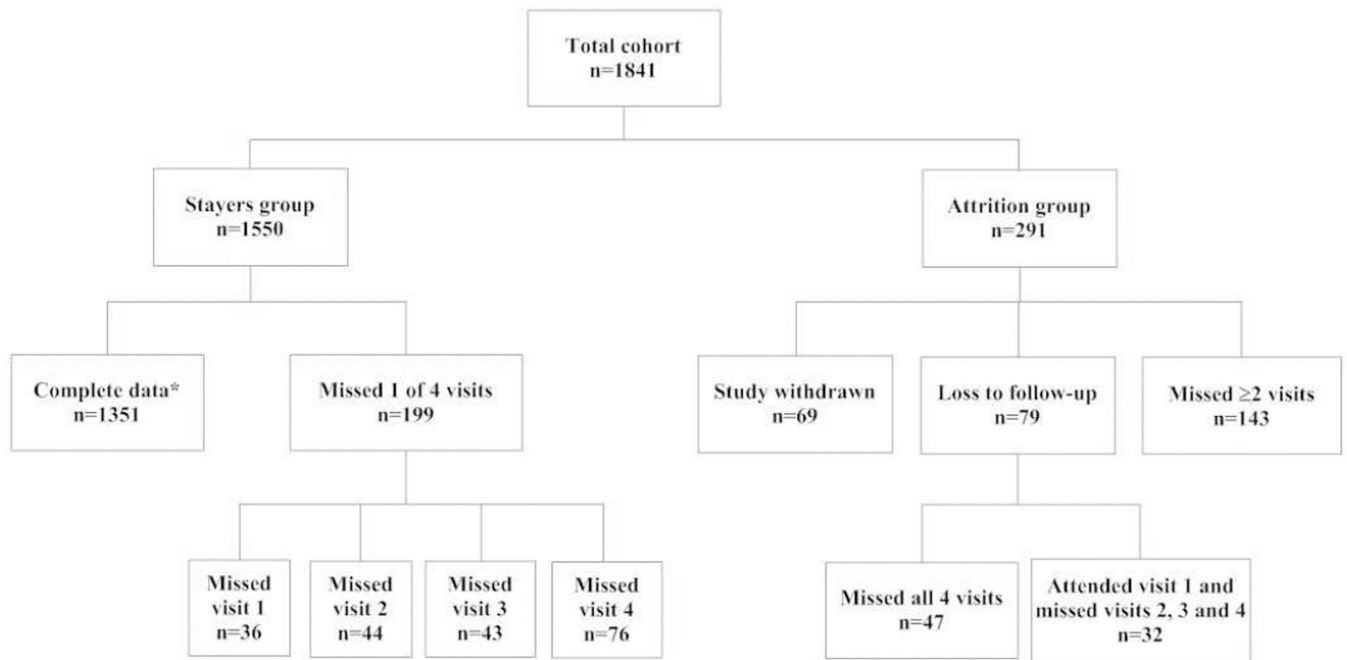
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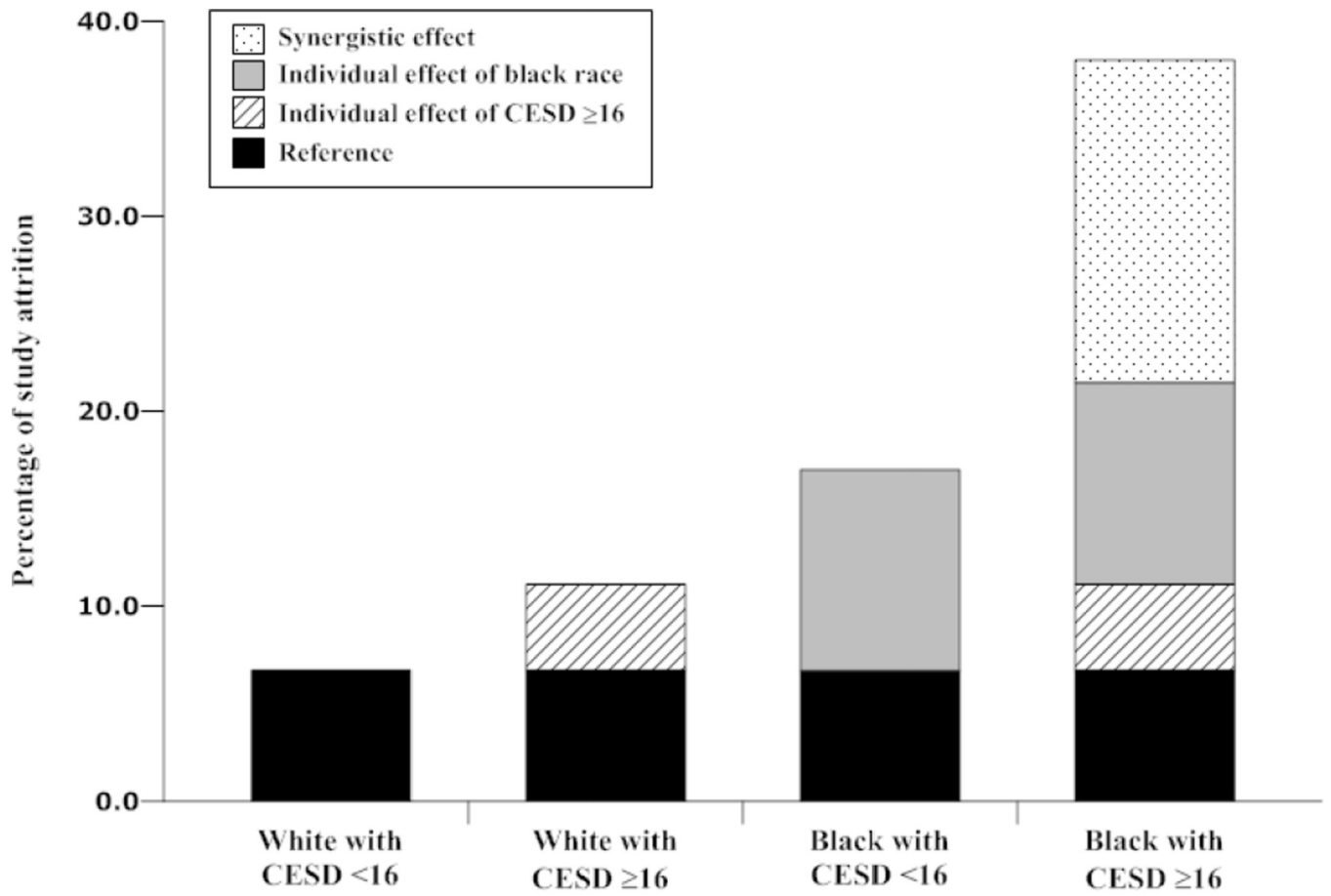


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**Figure 1.** Distribution of participants according to categories of study retention. Heart SCORE study, southwestern Pennsylvania, 2007–2011.  
\*Complete data: No missed visits (1 to 4)



**Figure 2.** Individual and joint associations between race, CES-D depression score  $\geq 16$  and study attrition. Heart SCORE study, southwestern Pennsylvania, 2007–2011. CES-D: Center for Epidemiologic Studies Depression Scale

**Table 1**

Sociodemographic and Clinical Characteristics for the Total Cohort and by Categories of Study Retention. Heart SCORE Study, Southwestern Pennsylvania, 2007–2011.

Characteristic	Total (n=1841)	Stayers group (n=1550)	Attrition group (n=291)	p
Age, mean (SD)	59.1 (7.5)	59.4 (7.4)	57.7 (7.9)	<0.001
Race, %				
White	57.0	60.5	38.1	<0.001
Black	43.0	39.5	61.9	
Female, %	65.8	66.4	62.2	0.22
Education level (Some college or more), %	81.4	82.1	77.6	0.07
Annual income, %				<0.001
<\$20,000	17.2	15.2	28.0	
\$20,000-< \$40,000	28.3	28.3	28.4	
\$40,000-< \$80,000	34.4	35.3	29.5	
\$80,000	20.1	21.2	14.0	
No insurance or self pay, %	5.5	4.4	11.5	<0.001
Having spouse or partner in the study, %	25.7	27.4	16.5	<0.001
BMI, Kg/m <sup>2</sup> , mean (SD)	30.1 (6.3)	29.8(6.1)	31.9(7.2)	<0.001
Metabolic status (ATP-3), %				<0.001
Normal	68.0	70.0	57.5	
Metabolic syndrome	21.1	20.9	21.8	
Diabetes	10.9	9.0	20.7	
Having been proactively recruited for the study, %	30.9	29.9	36.7	0.02
Having experienced blood drawn difficulty at baseline study visit, %	16.8	16.0	20.9	0.05

SD=standard deviation; BMI=Body mass index, ATP-3=Third Report of the Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III)

**Table 2**

Psychosocial Measures for the Total Cohort and by Categories of Study Retention. Heart SCORE Study, Southwestern Pennsylvania, 2007–2011.

	Total (n=1841)	Stayers group (n=1550)	Attrition group (n=291)	p
Depression (CES-D score $\geq 16$ ), %	11.6	10.0	22.9	<0.001
CMHI hostility, mean (SD)	8.1 (4.4)	7.9(4.3)	9.2 (4.7)	<0.001
STAI anger, mean (SD)	5.3 (3.6)	5.1 (3.5)	6.1 (4.3)	<0.001
STAI anxiety, mean (SD)	6.2 (4.8)	6.0 (4.6)	7.5 (5.7)	<0.001
Cohen stress score, mean (SD)	4.3 (3.0)	4.1 (2.9)	5.4(3.5)	<0.001
Unfair treatment, mean (SD)	7.2(4.5)	7.0 (4.4)	9.0 (4.9)	<0.001
Ongoing life events score, mean (SD)	5.5 (4.2)	5.2 (4.0)	7.3 (5.1)	<0.001
Life orientation test, mean (SD)	23.2 (4.0)	23.3 (3.9)	22.4 (4.6)	0.008
Life engagement score, mean (SD)	26.7 (5.3)	26.8 (5.2)	26.2 (5.4)	0.09
Social network diversity, mean (SD)	5.5(1.8)	5.5(1.8)	5.4 (2.0)	0.23
Number of social contacts, mean (SD)	27.7 (24.2)	27.6 (24.3)	28.5 (23.4)	0.62

CES-D: Center for Epidemiologic Studies Depression Scale; CMHI: Cook-Medley Hostility Scale; STAI anger: State-Trait Anger Inventory; STAI anxiety: State-Trait Anxiety Inventory.



Adjusted Associations of Sociodemographic, Clinical and Psychological Factors on Study Attrition. Heart SCORE Study, Southwestern Pennsylvania, 2007–2011.

**Table 3**

	Regression Model 1		Regression Model 2		Regression Model 3	
	OR	Confidence Interval	OR	Confidence Interval	OR	Confidence Interval
<b>Race (black vs white)</b>	2.75*	2.01,3.77	2.35*	1.70,3.26	2.21*	1.55,3.16
<b>Age (5-year increment)</b>	0.85**	0.77,0.95	0.86**	0.77,0.95	0.88**	0.79,0.99
<b>Sex (male vs female)</b>	1.46**	1.07, 1.99	1.48**	1.07,2.03	1.79**	1.27,2.54
<b>No insurance or self-pay (vs. insurance)</b>	2.54*	1.59,4.07	2.54*	1.58,4.09	2.04**	1.20,3.47
<b>Having spouse or partner in the study (vs. not)</b>	0.61**	0.40,0.93	0.61**	0.40, 0.94	0.60**	0.37,0.97
<b>Having been Proactively recruited for the study</b>	1.40**	1.03, 1.90	1.39**	1.02, 1.90	1.22***	0.86, 1.72
<b>Category of body weight (vs normal)</b>						
<b>Overweight</b>			1.21***	0.73,2.03	1.05***	0.60, 1.83
<b>Obese</b>			2.05**	1.26,3.34	1.80**	1.07,3.02
<b>CES-D ( 16 vs &lt;16)</b>					2.02**	1.29–3.19
<b>Ongoing life events score</b>					1.09*	1.04–1.13

CES-D: Center for Epidemiologic Studies Depression Scale

\* p<0.001,

\*\* p<0.05,

\*\*\* Non significant

Note: Regression Model 1 included race, age, sex, health insurance, having spouse or partner in the study and having been proactively recruited for the study. Regression Model 2 included variables in Model 1 plus categories of body weight. Regression Model 3 included variables in Model 2 plus CES-D and Ongoing life events score.