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Impact and Costs of Targeted Recruitment of Minorities to the National Lung Screening Trial

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Abstract

Background—To promote results in the National Lung Screening Trial (NLST) that are generalizable across the entire US population, a subset of NLST sites developed dedicated strategies for minority recruitment.

Purpose—To report the effects of targeted strategies on the accrual of underrepresented groups, to describe participant characteristics, and to estimate the costs of targeted enrollment.

Methods—The 2002–2004 Tobacco Use Supplement was used to estimate eligible proportions of racial and ethnic categories. Strategic planning included meetings/conferences with key stakeholders and minority organizations. Potential institutions were selected based upon regional racial/ethnic diversity and proven success in recruitment of underrepresented groups. Seven institutions submitted targeted recruitment strategies with budgets. Accrual by racial/ethnic category was tracked for each institution. Cost estimates were based on itemized receipts for minority strategies relative to minority accrual.

Results—Of 18,842 participants enrolled, 1576 (8.4%) were minority participants. The seven institutions with targeted recruitment strategies accounted for 1223 (77.6%) of all minority participants enrolled. While there was a significant increase in the rate of minority accrual pre-implementation to post-implementation for the institutions with targeted recruitment (9.3% vs. 15.2%, $P < 0.0001$), there was no significant difference for the institutions without (3.5% vs. 3.8%, $P = 0.46$). Minority enrollees at the seven institutions tended to have less than a high school education, be economically disadvantaged, and were more often uninsured. These socio-

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demographic differences persisted at the seven institutions even after adjusting for race and ethnicity. The success of different strategies varied by institution, and no one strategy was successful across all institutions. Costs for implementation were also highly variable, ranging from \$146 to \$749 per minority enrollee.

Limitations—Data on minority recruitment processes were not consistently kept at the individual institutions. In addition, participant responses via newspaper advertisements and the efforts of minority staff hired by the institutions could not be coded on Case Report Forms.

Conclusions—Strategic efforts were associated with significant increases in minority enrollment. The greatest successes require that *a priori* goals be established based on eligible racial/ethnic proportions; the historical performance of sites in minority accrual should factor into the selection of sites; recruitment planning must begin well in advance of trial launch; and there must be endorsement by prominent representatives of the racial groups of interest.

Keywords

minority recruitment; clinical trials; lung neoplasms/diagnosis; lung neoplasms/prevention & control; mass screening; patient selection

Introduction

Clinical trials significantly inform our methods of improving the prevention, early diagnosis, and successful treatment of malignancies. The participation of racial, ethnic, and other underrepresented groups in clinical trials is a critical link between scientific innovation and improvements in overall health care delivery and public welfare. The proportionate inclusion of demographic categories representative of eligible individuals helps to promote results that are generalizable across the entire population. Since the National Institutes of Health (NIH) Revitalization Act in 1993 [1], which was designed to address the historical challenges of underrepresentation in clinical trials, significant efforts have been made to reduce barriers to participation for underrepresented groups. However, despite advances, significant gaps in representation remain.

Barriers that limit the participation of minorities in medical research are complex and multifactorial, but relate primarily to three impediments: lack of awareness of clinical trials opportunities, lack of opportunity/access, and individual beliefs about participating in medical research [2, 3]. Barriers of awareness frequently stem from both a lower health literacy of potential participants as well as the lack of awareness of clinical trials opportunities by potential participants or their health care providers. Barriers of opportunity/access include: the fundamental study design or eligibility requirements, health insurance status, family or work obligations, potential costs or time required by participation, and geographic accessibility. Barriers due to individual perspective often result from mistrust of the medical community, cultural dissonance between participants and trial investigators, and perceived stresses imposed by participation in a clinical trial, such as burdensome procedures or fears of adverse effects of therapy [4, 5]. Despite these barriers, there remains an urgent need for prevention research in minority populations, as these groups have the highest rates of morbidity and mortality from preventable illnesses [6].

It is well established that the rates of participation in cancer clinical trials are low for all subsets of the general population. However, relative to treatment studies, prevention studies typically recruit an even smaller percentage of the individuals approached to participate [7]. Minority groups have historically been particularly underrepresented in these trials [8]. Among the more successful prevention trials to enroll minorities was the Selenium and Vitamin E Cancer Prevention Trial (SELECT), a large Phase III study evaluating the impact

of selenium and vitamin E on prostate cancer incidence. Among 35,534 participants, 22% were minorities with 15% African American, 6% Hispanic and 1% Asian [9]. The success of SELECT in recruiting minorities was multi-factorial: [a] *a priori* minority accrual goals were set based on racial and ethnic proportions in the United States and their prevalence of prostate cancer; [b] careful recruitment planning was initiated one year in advance of trial launch; [c] minority recruitment was a consideration in the original selection of sites, [d] the minimum age requirement of participants was lowered to 50 years for African American men, and [e] strategies included promotion of the trial by prominent representatives of the racial groups being targeted.

This paper reports on the implementation and outcomes of targeted strategies to recruit minorities into the National Lung Screening Trial (NLST), a randomized controlled trial (RCT) to assess whether screening individuals at high risk of lung cancer with low exposure dose helical computed tomography (LDCT) or standard chest x-ray can reduce lung cancer deaths. Launched in 2002, the study represents a collaboration between the National Cancer Institute (NCI) and the American College of Radiology Imaging Network (ACRIN) and is now in the post-imaging intervention, outcomes collection phase. The target accrual for the NLST was 50,000 participants, to provide 90% power to detect a 20% difference in lung cancer-specific mortality between the two screening arms. The accrual across the entire NLST was 53,456 participants; ACRIN institutions accrued 18,842 participants.

Although the NLST was not designed to address specific hypotheses relevant to the accrual of underrepresented populations, seven (7) of 23 NLST-ACRIN institutions implemented specific targeted recruitment strategies for accruing racial and ethnic minority groups. The objectives of this paper were to determine the effects of targeted strategies on accruing underrepresented minorities, the participant characteristics as a result of the targeted strategies, and the estimated costs of targeted enrollment.

Participants and Methods

Identifying Participating Institutions for Targeted Minority Recruitment

In screening trials, the effects of lead time associated with a sensitive screening test typically require that there be long term follow-up for mortality outcomes. The NLST institutions were highly motivated to accrue participants as rapidly as possible in order to increase the observation time for follow-up events. The anticipated accrual period was two years. Accrual began in August 2002 and ended four months ahead of schedule in April 2004. Eligibility criteria included asymptomatic current or former heavy smokers between the ages of 55 and 74 years. Former smokers must have quit smoking within the preceding 15 years. Excluded were individuals with a history of lung cancer at the time of enrollment or a history of treatment for, or evidence of, any active cancer, with the exception of non-melanoma skin cancer, within the preceding five years.

To enhance the accrual of minority populations, NLST-ACRIN institutions were identified that, from the time of trial launch, had shown strong performance in overall participant accrual, already had begun to enroll underserved participants successfully, and were situated in culturally diverse communities based on demographic statistics from the United States Census Bureau. Data reviewed in the selection process included detailed information on age, sex, and race/ethnicity in counties near the accrual institutions. Race was coded as follows: American Indian/Alaskan Native, Asian, Black/African American, Native Hawaiian/Pacific Islander, White/Caucasian, More than one race, or Unknown; and ethnicity was coded as Hispanic/Latino, Not Hispanic/Latino, or Unknown. Estimates of the relative proportions of racial and ethnic categories that fulfilled the NLST eligibility criteria for age and cigarette smoking history were derived from the U.S. Census Bureau's Tobacco Use Supplement

(TUS) of the Current Population Surveys for 2002–2004, the years corresponding to the period of NLST enrollment [10]. We estimated the trial-wide target accrual proportions to be 91.7% White, 5.5% African American, 1.0% Asian, 1.0% American Indian/Alaskan Native. For ethnicity, we estimated the trial-wide accrual proportion to be 2.4% Hispanic.

Strategic plans for racial and ethnic minority accrual began in earnest in March 2003 (Month 7). An initial meeting involving representatives of the American Cancer Society (ACS), the National Cancer Institute (NCI), the NCI Office of Communications, and ACRIN leadership was held to develop mechanisms to capitalize on existing ACS communications infrastructures and cancer-related events to promote the NLST across racial groups.

A series of conference calls was conducted to describe the targeted minority recruitment project across all NLST-ACRIN institutions. Barriers to minority enrollment and their potential solutions were reviewed. Institutions were advised that supplemental funding for targeted minority recruitment would be requested, but not guaranteed. All institutions were invited to identify a target minority population in their geographic region and submit a minority recruitment plan with budget. Ultimately, six (6) institutions submitted proposals for targeted recruitment. A seventh NLST-ACRIN institution not enrolling at the time of the project launch later submitted a proposal (Table 1).

These seven institutions with targeted minority accrual plans designed their strategies based on local resources and target populations. Each provided a detailed description of specific recruitment strategies. Reactive approaches, in which information was disseminated through various media to prompt prospective participants to contact project staff, involved direct mailing in culturally diverse regions based on zip codes as well as advertising on specific television stations, radio stations, and newspapers. Trial-wide, brochures were adapted to reflect the culture of the racial/ethnic groups of interest and written information, consent forms and participant completed questionnaires were translated into Spanish and Asian dialects. Proactive strategies that involved face-to-face interactions with prospective participants were conducted through local health fairs, faith-based organizations, and outreach programs with physicians who treat underrepresented groups. Some institutions enlisted “cultural insiders” in the form of minority participant champions for word-of-mouth dissemination as well as racial/ethnic matching of NLST staff and trial participants.

The seven institutions initiated their strategic plans according to their own local resources and timelines. All institutions initiated some or all strategies beginning in May 2003 (Month 9). Data on absolute numbers and percentages of enrollment across all under-represented groups were monitored monthly across all NLST institutions.

After obtaining written informed consent, NLST staff completed registration data based upon participant responses that included information on age, sex, race, ethnicity, and insurance status. Following registration, a separate form was either administered by NLST staff or participant self-completed that included detailed information on health, symptoms, and additional demographic information on participant level of education, household income, and marital status. All enrolled participants also were asked to record how they came to know about the trial; however, the response categories did not include all strategies that were implemented. In particular, some institutions implemented targeted newspaper ads, for which there was no specific response category available. Similarly, the efforts of NLST-ACRIN minority staff who were hired by sites and consultants who visited community organizations are not directly represented; their efforts were largely reported as “Word of Mouth” and “Other.” From these responses, the data on targeted enrollment efforts were derived.

Statistical Analysis

For this analysis, a “non-minority” participant was defined as being both White and of non-Hispanic ethnicity. All other participants were defined as “minority.” Participants of White race with unknown ethnicity and participants of unknown race with non-Hispanic ethnicity were both coded as “non-minority.” Participant characteristics for the seven institutions that implemented targeted recruitment strategies and for the sixteen that did not participate in targeted recruitment were summarized. Chi-square tests were used to test the overall differences in race, ethnicity, gender, education levels, household incomes and insurance status between the institutions with and without targeted strategies, as well as the differences after stratifying by participant minority status. Monthly minority accrual for the institutions with and without targeted strategies were plotted along with Lowess smoothed lines with 6-month smoothing window to depict any trend. The cost of targeted minority recruitment at each site was calculated by dividing the total cost of the minority strategies, as provided by itemized receipts, by the number of minority participants recruited.

Results

Participant characteristics

The locations and populations of interest of the seven institutions that participated in targeted recruitment of minority populations are listed in Table 1. Trial-wide, NLST-ACRIN enrolled 18,842 participants, of whom 1576 (8.4%) were from racial and ethnic minority populations. Of the 1576 minority participants enrolled, 1223 (77.6%) were enrolled at one of the seven institutions that implemented targeted recruitment strategies. The overall median age of participants was 61 years (range: 55–74 yrs); there was no difference in the age distribution between institutions with and without targeted recruitment strategies. Institutions that targeted minority populations had a higher proportion of current smokers than institutions without targeted minority recruitment plans (53.8% of 9,400 vs. 47.2% of 9,442, $P < 0.001$).

Detailed race, ethnicity and gender distributions for the seven individual institutions that implemented targeted recruitment strategies, their combined data, and the combined distributions for institutions without targeted recruitment strategies are shown in Table 2. When stratified by recruitment strategy, there were significant differences for race, ethnicity, and gender between institutions with and without targeted minority recruitment plans ($P < 0.001$ for each). In particular, institutions with targeted recruitment enrolled a higher percentage of African American (9.5% vs. 2.0%), Asian (0.9% vs. 0.3%) and Hispanic (1.7% vs. 0.9%) participants, and had a higher proportion of male participants (57.2% vs. 53.2%).

Baseline socioeconomic characteristics of participants, stratified by minority status and by institution type are shown in Table 3. Significant differences were found between institutions with and without targeted minority enrollment strategies for level of education, household income, and insurance status ($P < 0.001$ for each). In particular, institutions with targeted enrollment strategies had a higher proportion of participants who reported less than a high school education (8.3% vs. 4.9%), household incomes of less than \$15,000 (12.1% vs. 7.2%), and no insurance (7.5% vs. 3.9%). These differences persisted even after accounting for participant minority status, suggesting that geographic location partially accounted for the differences. Trial-wide, 26.8% [weighted average from Table 3, (363+59)/(1223+353)] of minority participants reported household incomes less than \$15,000 vs. 8.1% of White/Non-Hispanic participants, and 13.8% [weighted average from Table 3, (191+26)/(1223+353)] of minorities were uninsured vs. 5.0% White/Non-Hispanic ($P < 0.001$ for each).

Effect and costs of targeted minority recruitment strategies

The effect of targeted minority recruitment strategies is summarized in Table 4. Prior to implementation of these strategies (roughly Month 9 of the trial), accrual rates of minority racial and ethnic groups were 2.6 fold higher at the institutions that implemented targeted recruitment strategies than at the other institutions (9.3% of participants vs. 3.5%, $P<0.0001$). Following implementation of targeted accrual plans, the minority accrual rate was 4.0 fold higher at the institutions that targeted minorities (15.2% of participants vs. 3.8%). While there was a significant increase in the rate of minority accrual pre-implementation to post-implementation for the institutions with targeted recruitment (9.3% vs. 15.2%, $P<0.0001$), there was no significant difference for the institutions without (3.5% vs. 3.8%, $P=0.46$). The actual monthly minority accrual rates along with smoothed lines are plotted in Figure 1. The rate of minority accrual increased rapidly soon after the targeted recruitment strategies were implemented at the institutions with dedicated strategies, whereas the rate of minority accrual remained relatively stable at the other institutions.

The numbers of participants from minority populations accrued based on specific strategies at the seven institutions are summarized in Table 5 along with the total costs for implementing the recruitment strategies at each site. Total costs at each site were calculated from itemized receipts submitted to ACRIN Headquarters during the enrollment period; institutions were ultimately reimbursed for half of their expenses for targeted recruitment. There was no common strategy that worked well for all seven institutions. The calculated cost per minority participant varied widely from \$146 to \$749 per minority participant enrolled.

Discussion

Our experience in the NLST-ACRIN underscores both the need for and success of dedicated financial resources and strategic planning to successfully engage underserved populations in clinical trials. The participation of minorities is essential for the generalizability of trial results, as a means to ameliorate health disparities, and to ensure the equitable distribution of the benefits and burdens of clinical trials. Unfortunately, trial designs, inequities in health care delivery, socioeconomic and educational background, and cultural perceptions all play significant roles in determining the willingness of minority populations to participate in clinical trials.

In the NLST-ACRIN, recruitment goals were developed prior to trial launch, but intense strategies for targeted minority recruitment were implemented roughly half-way through the accrual period. The implementation of dedicated strategies led to significant increases in minority accrual at almost all of the seven institutions; however, had these strategies been implemented at the outset, the proportions of racial and ethnic minorities in the NLST-ACRIN might well have exceeded projections. In addition, institutions were reimbursed for only approximately half of the costs they incurred for minority accrual. Had money for minority accrual been included in the study budget during the planning phases of NLST, institutions may have been more inclined to maximize minority recruitment efforts, which might have helped to increase the proportions of racial and ethnic minorities.

The institutions with dedicated minority recruitment enlisted a number of strategies to promote awareness of the trial in underrepresented communities. Each institution designed their specific recruitment strategies, staffing patterns, and visit flow based on their local strengths and constraints. To build trust and alleviate attitudinal barriers to participation, many institutions worked through community-based leaders and groups who had the trust of the target population. Efforts included working with social and religious organizations, businesses, and local medical providers to emphasize the risk factors associated with lung

cancer. Some institutions hired racially/ethnically diverse, bilingual staff from the target population. These targeted enrollment efforts were highly time intensive, often requiring that staff be away from other clinic responsibilities. In some situations, institutions that partnered with community clinics found that coordination of efforts was challenging or that recruitment was not a priority of the community clinic. These challenges in joining forces with community providers have been well described in other clinical trials [11].

Considerable infrastructure support was provided by the National Cancer Institute (NCI), the NCI Office of Communications, and the American Cancer Society to disseminate information in minority communities. These organizations included minority representatives and individuals with prior experience in recruiting underserved populations to clinical trials, all of whom provided insights on strategic approaches. The costs to develop, print, and mail participant brochures representative of the targeted minority populations were borne by the NCI and ACS and contained their logos to reinforce the credibility of the trial. These targeted mailings were dominant strategies in three of seven sites.

Radio, television, and newspaper advertisements accounted for a substantial proportion of minority enrollment at four institutions, but were also among the most expensive strategies. Despite these costs, institutions anecdotally reported that such advertising was most successful when overlapping strategies were employed simultaneously to ensure the greatest message saturation. However, participant exposure to multiple advertising sources was not specifically tracked, and the ultimate success of such a strategy cannot be quantified. Nevertheless, these media campaigns proved to be more successful in attracting African American than Hispanic populations.

In the NLST-ACRIN, participants were asked to complete three annual study visits as well as bi-annual health outcomes questionnaires for up to eight years. This level of commitment may itself have been a disincentive to participation. Geography was an additional deterrent to participation because of issues related to transportation to and from the NLST institution. Some institutions provided participants with taxis or reimbursement for bus transportation, but these transportation challenges were likely limiting factors to enrollment. Inadequate health insurance was another disincentive perceived by NLST-ACRIN staff. The trial covered the costs of screening examinations, and had factored additional costs for covering downstream diagnostic imaging in a small proportion of participants, but could not guarantee coverage for invasive tests. Attempts were made to refer socioeconomically disadvantaged participants with positive screening tests to neighborhood physicians and free clinics, but these concerns were clearly impediments to enrollment. A final fear expressed by a number of minority participants was the possibility of being denied future health insurance coverage as a result of findings related to annual screening exams. In fact, up to twelve participants reported that they had significant restrictions on obtaining health insurance coverage as a consequence of having had an abnormal screening result.

Because the time and effort involved in trial participation can be forbidding, some institutions scheduled evening and weekend hours, and implemented toll-free telephone numbers for potential participants to contact project staff. Incentive in the form of payment for time and travel for each on-site visit was provided. Finally, promotional items such as NLST t-shirts and coffee mugs were provided to participants as additional incentives. The value of these small items with respect to recruitment are indeterminate.

Although many institutions employed similar recruitment strategies, their methods of implementation varied widely. As a result, not all strategies and institutions achieved equal recruitment success. However, because the focus of the study was not on comparing various recruitment strategies, NLST-ACRIN did not systematically explore the factors influencing

trial participation by minority populations. Although we believe that efforts to increase trial awareness and to bridge community trust were crucial in attracting participants, the impact of specific grass roots efforts can only be indirectly assessed. Also, our results are subject to selection bias since this was an observational study nested within the NLST, and participation in targeted enrollment was not randomly assigned, but based on solicitation of sites already demonstrating multi-racial and multi-ethnic accrual from the time of trial launch. Whether the accrual differences we observed relate to this selection bias or to recruitment methods is speculative. The differences in recruitment success may relate as much to the institutions themselves—their organizational structure, accessibility, and experience in conducting large clinical trials—as it does to the racial/ethnic and socio-demographic characteristics of the participants.

Conclusion

Our data are consistent with the experience of other trials in that minority populations were disproportionately less well educated, economically disadvantaged, and more often uninsured. Interestingly, these socio-demographic differences persisted at the seven institutions even after accounting for race and ethnicity, which may reflect geographic characteristics of the institutions themselves. These variables impose considerable challenges for clinical trials participation which require that investigators engage and educate underrepresented groups about the index disease, adequately communicate the concepts of randomization and equipoise in a randomized controlled trial design, and the potential risks and benefits to individuals as well as their communities. Enlisting community physicians and leaders as champions of the trial will significantly influence perceptions of the value of the trial and quell mistrust. Trial designs must establish dedicated strategies for reaching and recruiting minority populations during protocol development, anticipate the additional resources required, implement strategies at the outset, and incorporate regular tracking of the strategies for success or failure. Finally, flexibility in trial design, site operations, considerations of transportation, and reimbursement for opportunity costs may impact the success of enrolling minority participants.

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Figure 1.

Proportion of enrollees from minorities each month for institutions with targeted recruitment strategies (top curves) and all others (lower curves). Dashed lines without points are derived from Lowess smoothers with 6-month windows.

* 5/03 – Date corresponding to when institutions with targeted recruitment initiated some or all strategies.

Table 1

NLST-ACRIN Institutions That Participated in Targeted Recruitment of Minority Populations

Institution	Location	Population of Interest
The Emory Clinic	Atlanta, GA	African American
Jewish Heart and Lung Institute	Louisville, KY	African American
Johns Hopkins University	Baltimore, MD	African American
M.D. Anderson Cancer Center	Houston, TX	Hispanic
St. Elizabeth Health Center ^{<i>1</i>}	Youngstown, OH	African American
University of California Los Angeles	Los Angeles, CA	African American, Hispanic, Asian
Wake Forest University School of Medicine	Winston-Salem, NC	African American

^{*1*} St. Elizabeth Health Center was not initially an accruing NLST-ACRIN institution, but later submitted a plan for recruiting minority populations.

Table 2

Baseline racial, ethnic and sex characteristics of participants at the individual and collective institutions with minority recruitment plans and at the other NLST-ACRIN institutions.

	Institutions with Targeted Recruitment	Institutions without Targeted Recruitment	Trial-wide Total	Pre-trial Targets (%)
Race ^I				
American Indian or Alaskan	41 (0.4%)	27 (0.3%)	68 (0.4%)	1.0%
Asian	81 (0.9%)	29 (0.3%)	110 (0.6%)	1.0%
African American	897 (9.5%)	191 (2.0%)	1088 (5.8%)	5.5%
Native Hawaiian	3 (0.0%)	3 (0.0%)	6 (0.0%)	NA
White	8257 (87.8%)	9150 (96.9%)	17407 (92.4%)	91.7%
More than one race	69 (0.7%)	29 (0.3%)	98 (0.5%)	NA
Unknown	52 (0.6%)	13 (0.1%)	65 (0.3%)	NA
Ethnicity ^I				
Hispanic or Latino	163 (1.7%)	82 (0.9%)	245 (1.3%)	2.4%
Non-Hispanic	9200 (97.9%)	9349 (99.0%)	18549 (98.4%)	97.6%
Unknown	37 (0.4%)	11 (0.1%)	48 (0.3%)	NA
Gender ^I				
Male	5381 (57.2%)	5021 (53.2%)	10402 (55.2%)	-
Female	4019 (42.8%)	4421 (46.8%)	8440 (44.8%)	-
Total	9400 (100%)	9442 (100%)	18842 (100%)	100%

^I Chi-square test p-value < 0.001 comparing combined institutions with targeted recruitment vs. institutions without (unknowns excluded).

Table 3

Baseline socioeconomic variables of NLST-ACRIN participants across all institutions, stratified by institution type and racial/ethnic status.

	Institutions with Targeted Recruitment Strategies (N = 7)			Other Institutions (N = 16)		
	Minority Participants	White and Non-Hispanic ¹	Total ²	Minority Participants	White and Non-Hispanic ¹	Total ²
Education³	N (%)					
Less than high school	217 (17.7%)	566 (6.9%)	783 (8.3%)	42 (11.9%)	424 (4.7%)	466 (4.9%)
High school graduate or GED	314 (25.7%)	1855 (22.7%)	2170 (23.1%)	70 (19.8%)	2106 (23.2%)	2177 (23.1%)
Post-high school: technology school, associate degree, some college	390 (31.9%)	2801 (34.3%)	3192 (34.0%)	120 (34.0%)	3143 (34.6%)	3265 (34.6%)
Bachelor's degree	136 (11.1%)	1452 (17.8%)	1590 (16.9%)	43 (12.2%)	1560 (17.2%)	1603 (17.0%)
Graduate or professional school	133 (10.9%)	1282 (15.7%)	1417 (15.1%)	66 (18.7%)	1596 (17.6%)	1662 (17.6%)
Other/Unknown/Missing	33 (2.7%)	213 (2.6%)	248 (2.6%)	12 (3.4%)	256 (2.8%)	269 (2.8%)
Household income³	N (%)					
< \$15,000	363 (29.7%)	775 (9.5%)	1138 (12.1%)	59 (16.7%)	622 (6.8%)	681 (7.2%)
\$15,000 – \$34,999	295 (24.1%)	1772 (21.7%)	2068 (22.0%)	82 (23.2%)	1912 (21.0%)	1994 (21.1%)
\$35,000 – \$64,999	222 (18.2%)	2270 (27.8%)	2493 (26.5%)	90 (25.5%)	2736 (30.1%)	2828 (30.0%)
\$65,000 – \$100,000	122 (10.0%)	1400 (17.1%)	1522 (16.2%)	42 (11.9%)	1696 (18.7%)	1738 (18.4%)
> \$100,000	64 (5.2%)	890 (10.9%)	956 (10.2%)	28 (7.9%)	1003 (11.0%)	1031 (10.9%)
I prefer not to answer/Unknown/Missing	157 (12.8%)	1062 (13.0%)	1223 (13.0%)	52 (14.7%)	1116 (12.3%)	1170 (12.4%)
Insurance Status³	N (%)					
Private insurance and/or Medicare	859 (70.2%)	7165 (87.7%)	8031 (85.4%)	278 (78.8%)	8211 (90.4%)	8492 (89.9%)
Medicaid	38 (3.1%)	41 (0.5%)	79 (0.8%)	10 (2.8%)	78 (0.9%)	88 (0.9%)
Medicaid and Medicare	35 (2.9%)	54 (0.7%)	89 (0.9%)	13 (3.7%)	83 (0.9%)	96 (1.0%)
Military or Veteran's Administration	69 (5.6%)	278 (3.4%)	347 (3.7%)	16 (4.5%)	227 (2.5%)	243 (2.6%)
No insurance	191 (15.6%)	515 (6.3%)	707 (7.5%)	26 (7.4%)	340 (3.7%)	366 (3.9%)
Decline to answer/Other/Unknown	31 (2.5%)	116 (1.4%)	147 (1.6%)	10 (2.8%)	146 (1.6%)	157 (1.7%)
Total	1223 (100%)	8169 (100%)	9400 (100%)	353 (100%)	9085 (100%)	9442 (100%)

¹ White and Non-Hispanic included individuals who reported white race and non-Hispanic ethnicity. White race and unknown ethnicity as well as unknown race and non-Hispanic ethnicity are also included in this demographic category.

² A total of 8 participants at the institutions with targeted recruitment and 4 participants at the institutions without targeted recruitment had unknown race and unknown ethnicity and so could not be classified as minority or white and non-Hispanic. These participants are not included in the table.

³ Chi-square test p-value <0.001 comparing combined institutions with targeted recruitment vs. institutions without (unknown, missing and declined responses excluded).

Table 4

NLST-ACRIN enrollment statistics for special populations before and after implementation of targeted recruitment strategies, stratified by institution type.

Type of Institution	Time Period ¹	Minority participant	White and Non-Hispanic participant ²	Total ^{3,4}
Institutions with Targeted Recruitment Strategies (N = 7)	Pre-Implementation	323 (9.3%)	3155 (90.6%)	3482
	Post-Implementation	900 (15.2%)	5014 (84.7%)	5918
Other Institutions (N = 16)	Pre-Implementation	112 (3.5%)	3056 (96.4%)	3171
	Post-Implementation	241 (3.8%)	6029 (96.1%)	6271
Total		1576 (8.4%)	17254 (91.6%)	18842

¹ Pre-implementation refers to the period on or prior to 5/31/2003.

² White and Non-Hispanic included individuals who reported white race and non-Hispanic ethnicity. White race and unknown ethnicity as well as unknown race and non-Hispanic ethnicity are also included in this demographic category.

³ A total of 8 participants at the institutions with targeted recruitment and 4 participants at the institutions without targeted recruitment had unknown race and unknown ethnicity and so could not be classified as minority or white/non-Hispanic. These participants are not included in the table.

⁴ Chi-square test p-values comparing proportion of minorities before vs. after implementation was <0.0001 for institutions with targeted strategies and 0.45 for those without.

Table 5

NLST-ACRIN targeted recruitment strategies by type, cost, and minority enrollment yield.

Recruitment Strategy	Institutions N (%)							Total
	The Emory Clinic	Jewish Heart and Lung Institute	Johns Hopkins University	M.D. Anderson Cancer Center	St. Elizabeth Health Center	University of California Los Angeles	Wake Forest University School of Medicine	
Local National Radio ads	15 (7.9%)	1 (0.9%)	59 (13.8%)	1 (0.9%)	3 (3.9%)	109 (41.6%)	1 (2.0%)	189 (15.5%)
Local National TV ads	119 (62.6%)	29 (27.1%)	117 (27.5%)	19 (17.1%)	9 (11.7%)	18 (6.9%)	13 (26.0%)	324 (26.5%)
Physician Clinic referral	10 (5.3%)	3 (2.8%)	2 (0.5%)	0 (0.0%)	4 (5.2%)	4 (1.5%)	2 (4.0%)	25 (2.0%)
Word of mouth	9 (4.7%)	10 (9.3%)	125 (29.3%)	8 (7.2%)	20 (26.0%)	18 (6.9%)	4 (8.0%)	194 (15.9%)
Targeted mailing	12 (6.3%)	51 (47.7%)	76 (17.8%)	51 (45.9%)	14 (18.2%)	39 (14.9%)	15 (30.0%)	258 (21.1%)
Other recruitment effort ¹	25 (13.2%)	13 (12.1%)	47 (11.0%)	32 (28.8%)	27 (35.1%)	74 (28.2%)	15 (30.0%)	233 (19.1%)
Total minority accrual	190 (100%)	107 (100%)	426 (100%)	111 (100%)	77 (100%)	262 (100%)	50 (100%)	1223 (100%)
Total institutional cost ²	\$27,726	\$37,854	\$126,600	NA	\$16,068	\$99,331	\$37,468	\$345,047 ³
Total cost per minority participant	\$146	\$354	\$297	NA	\$209	\$379	\$749	\$310 ³

¹ Other recruitment effort includes newspaper ads, job/health fairs and minority recruiters.

² Information obtained from receipts provided by the sites.

³ Excludes M.D. Anderson Cancer Center, for which cost data were not available.