

CHAPTER 5

STUDY SELECTION AND PARTICIPATION

INTRODUCTION

During the design phase of the Air Force Health Study (AFHS), the authors of the Study Protocol (1) anticipated that a loss of participants between followups would pose the greatest threat to study validity. In particular, they expected differential compliance, with relatively more Ranch Hands choosing to return to the study than Comparisons, and with health differences of unknown character between refusing Ranch Hands and refusing Comparisons. In an attempt to partially correct the situation, the study design specified that refusing Comparisons would be replaced by Comparisons with the same values of the matching variables (age, race, rank, and military occupation) and the same health perception. In this way, the Replacement Comparisons would serve as surrogates for Comparisons who refused to participate. This method of replacement would tend to reduce bias resulting from refusal in the Comparison group and also would maintain group size. No corresponding strategy for the Ranch Hands was possible, because all Ranch Hands had been identified and invited to participate.

The first Comparison in each randomized matched set who was asked to participate in the Baseline questionnaire and physical examination was identified as the Original Comparison for his respective Ranch Hand (in accordance with the Study Protocol). If the Original Comparison was noncompliant (refused to participate, was partially compliant [completed the Baseline questionnaire but did not complete the Baseline physical examinations], or was unlocatable), a "Replacement" Comparison was invited in his place. Replacement Comparisons were identified as such in the data base to satisfy the Study Protocol requirement that they be contrasted based on health with the refusing Original Comparisons (also known as refusals). In the case of an unlocatable Original Comparison, this contrast is, of course, not possible. Original Comparisons who were partially compliant were replaced, but deceased Original Comparisons were not.

The statistical contrast of replacements and refusals was to be based on responses to a telephone questionnaire administered to refusals and to their potential replacements. This questionnaire assessed self-perception of health, days lost from work due to illness, and medication use, and was to serve as the basis for health matching required by the Study Protocol. Although the Study Protocol is not explicit on this point, it implies that the decision to include or exclude the replacements from the study should be based only on this contrast. A telephone questionnaire was administered to refusals at the Baseline and at the 1985 followup examination. At the 1987 followup examination, refusals were asked during the scheduling process for their self-perception of health. At the 1992 followup examination, schedulers attempted to obtain current perception of health compared to others their age from all participants contacted by telephone. Health-matching of replacements was not implemented at the Baseline but was implemented with the 1985, 1987, and 1992 followup examinations. Replacement Comparisons were matched to noncompliant (refusal, partially

compliant, or unlocatable) Original Comparisons with respect to age, race, rank, and military occupation at all examinations.

In this chapter, cumulative study compliance is summarized, and refusing Ranch Hands and Comparisons at the 1992 followup examination are contrasted with respect to reason for refusal and reported health status. All Ranch Hands and Comparisons were contrasted on reported health with adjustment for compliance (fully compliant or refusal). (Only fully compliant Ranch Hands and Comparisons are described with respect to reported health, medication, and work loss because no partial compliance occurred in 1992.) Scheduling patterns were compared by plotting cumulative compliance versus calendar time for Ranch Hands, Original Comparisons, and Replacement Comparisons. Adherence to the replacement algorithm for noncompliant Original Comparisons was investigated at the 1992 followup. Replacement Comparisons were contrasted with their corresponding Original Comparisons on reported health status. Ranch Hands and Comparisons who passively refused the 1992 followup examination (scheduled but failed to appear at the clinic) were contrasted with respect to reported health status. Statistical methods used in this chapter include log-linear models, stepwise logistic regression, and Pearson's chi-square statistic.

FACTORS KNOWN OR SUSPECTED TO INFLUENCE STUDY PARTICIPATION

A multitude of factors might influence study participation. These may be broadly classified as health, logistic, operational, publicity, or demographic factors. For example, health factors are thought to include self-perception of health as well as demonstrable health indicators, such as medication use and work days lost due to illness or injury. Logistic factors include distance to the examination site, reluctance to spend time away from family or job, income, and occupation. Demographic factors include flying status, age, race, or military duty status (active, retired, separated). Operational factors include any aspect of study operation that may cause differential compliance, such as differential treatment of participants during scheduling, physical examination, interview, or debriefing. Publicity factors are related to national attitudes and media presentations regarding the Agent Orange (Herbicide Orange) issue, the Vietnam War, veteran health care, or health care in general. Additionally, these considerations may affect people differently and, in particular, may influence Ranch Hands differently than Comparisons.

The decision to volunteer for this study, or any study, is admittedly complex, making statistical assessment of compliance bias difficult and necessarily crude in that many of the factors contributing to self-selection cannot be measured directly. Instead, compliance bias was investigated at the 1992 followup with respect to self-perception of health. Medication use and days lost from work due to illness or injury were taken from questionnaire and physical exam data, and therefore were available only for fully compliant participants. In 1992, no partial compliance (compliant to the questionnaire and noncompliant to the physical examination) occurred because both the physical examination and the questionnaire were administered at the exam site.

1992 FOLLOWUP SCHEDULING AND REPLACEMENT OPERATION

All Comparisons who had been invited to participate in the Baseline or 1985 or 1987 followups were invited to participate in the 1992 followup. If no previously invited Comparisons for a particular Ranch Hand agreed to participate in 1992, schedulers attempted to recruit a replacement from a matched set of up to 10 candidate Comparisons whose self-reported health status in 1992 (reported in the categories: excellent, good, fair, or poor) matched that of the noncompliant Original Comparison for that Ranch Hand. In 1992, as in both previous followup scheduling operations, replacements were matched to noncompliant Original Comparisons on the basis of reported health status in addition to the four matching variables (age, race, rank, and military occupation). The Replacement Comparisons were men who served in C-130 units in Southeast Asia (SEA) between 1962 and 1971, but who did not participate actively in the Baseline phase of the study. If a willing, health-matched (excellent, good, fair, poor) participant was not found in the matched set, self-reported perceptions of health status were dichotomized into excellent or good, and fair or poor categories, and matched to the dichotomized health status of the noncompliant Original Comparison. If this second method for identifying a suitable replacement failed, no replacement was made.

There were two exceptions to the replacement strategy. First, the Study Protocol required that the noncompliant Original Comparisons report their health status during the 1992 scheduling effort so that they could be used to recruit Replacement Comparisons with the same health status. Occasionally, Original Comparisons refused to talk or respond. In those cases, Replacement Comparisons for each Original Comparison were recruited in the (random) order in which they were listed in the Air Force data file. Second, as previously mentioned, no replacement was made if the Original Comparison for the Ranch Hand was deceased.

The scheduling process had three objectives:

- Maximize participation rates (both in the 1992 followup and future followups).
- Ensure that Ranch Hands and Comparisons were recruited using the same procedures and with the same effort.
- Ensure that, whenever possible, at least one Comparison was examined for each Ranch Hand.

These objectives led to a set of conflicting priorities: maximizing participation rates meant giving each potential participant every opportunity and encouragement to participate (without being so persistent as to lose the cooperation of unwilling respondents in future followups). This careful approach had to be balanced against the need to quickly identify uncooperative Comparisons and eliminate them from the scheduling process so that they could be replaced. Potential participants were given the following priorities in the scheduling process:

- Participants who requested specific examination dates from the Air Force prior to the beginning of the study were contacted first to accommodate those requests.
- Participants listing their occupations as “teacher” during their previous interviews, and those residing outside of the United States at the time of the 1992 study, were contacted next due to their probable travel time constraints.
- Participants who had been fully compliant at previous followups were given third priority.

Three attempts were made to convert potential participants who initially refused over the telephone to volunteer for the study. A minimum of 4 weeks was allowed between conversion attempts. If the three attempts were unsuccessful, the participant was considered a final refusal and replaced when appropriate. The only exceptions to this rule were participants who had either shown themselves hostile to the study in previous followups (in which case they were not contacted in 1992), or who were so vehement in their refusal to initial scheduling contacts in 1992 that efforts to recruit them were terminated after the first or second refusal conversion attempt. Participants who broke three examination appointments were considered final refusals. Participants unwilling to commit to an examination appointment after six contacts also were considered final refusals.

Small adjustments were made to the scheduling process as the study proceeded to accommodate specific situations and the approaching end of the scheduling period. Because of the lack of success of most third refusal conversion attempts, this last attempt was changed to a request for health status only (as this information was required for the replacement process). A month before the end of scheduling, the time between conversion attempts was reduced to 2 weeks, and within the last 2 weeks of data collection, the number of conversion attempts was reduced to two. Some potential participants could not be contacted directly because other household members either refused for them, or refused to bring them to the telephone. A maximum of six contacts with such “gatekeepers” was attempted before the participant was considered a refusal. This number was reduced to four during the last 2 weeks of scheduling. At that time, participants were eliminated from the scheduling process and replaced, if appropriate, after three contacts with the participant himself, four contacts with a “gatekeeper,” or three messages left on his answering machine without any response. Potential participants who were designated as final refusals at any stage in the scheduling process were provided with the toll-free number for the study, and allowed to volunteer to participate at any time.

The percent completing the 1992 physical examination is plotted by calendar date in Figure 5-1 for Ranch Hands, Original Comparisons, Replacement Comparisons, and all Comparisons. These patterns are similar to those seen at previous followups.

1992 FOLLOWUP COMPLIANCE

Of the 1,148 eligible Ranch Hands, 952 (82.9%) participated in the 1992 followup examination while 912 (76.3%) of the 1,195 eligible Original Comparisons participated. Of the 567 Replacement Comparisons eligible for the 1992 followup, 369 (65.1%) chose to

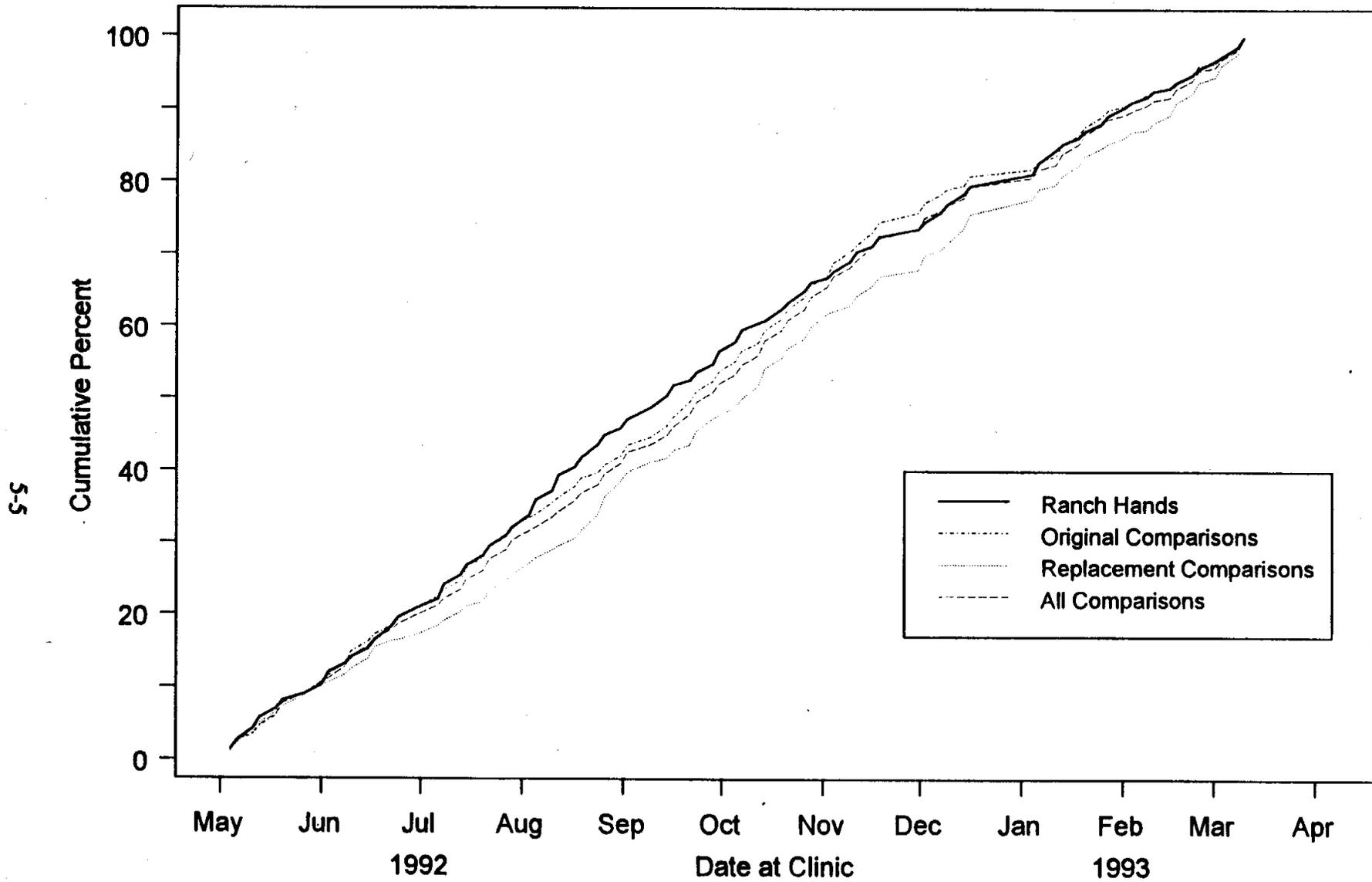


Figure 5-1.
Percent Completed Physical Examination, by Calendar Date

attend the examination. Table 5-1 provides counts for the Ranch Hands. Total Comparison counts are summarized in Table 5-2. Original Comparison counts are presented in Table 5-3 and Replacement Comparison counts are provided in Table 5-4. Within the Comparison tables, the "New to Study" rows include potential Replacement Comparisons who were found to be deceased when contact was attempted. These same deceased potential replacements are then accounted for in the rows marked "Died." Undefined categories are indicated by dashes. For example, dashes appear when partially compliant participants at Baseline could not be partially compliant at a later examination because partial compliance only occurred when a participant agreed to the Baseline questionnaire but refused to attend the physical exam. As stated previously, no partial compliance occurred in 1992 because both the Baseline questionnaire and physical examination were given at the same site. However, there were two participants who took the physical exam but refused to complete the questionnaire. Ninety-one percent of living Ranch Hands and 92 percent of living Comparisons who were fully compliant at the Baseline examination returned for the 1992 followup.

Four Ranch Hands, 20 Original Comparisons, and 37 Replacement Comparisons were fully compliant and examined for the first time at the 1992 followup examination. Table 5-5 describes these newly compliant participants in terms of their compliance at the Baseline, 1985, and 1987 followup studies. Two of the four newly examined Ranch Hands had refused all three previous examinations; the other two Ranch Hands were partially compliant at one previous examination and had refused two previous examinations. Eighteen of the 20 new Original Comparisons and 17 of the 37 new Replacement Comparisons had refused at least one of the previous exams. One new fully compliant Original Comparison was unlocatable in both 1985 and 1987. Three new fully compliant Replacement Comparisons were new to the study in 1987, but were only partially compliant at the 1987 followup examination. One of the new Original Comparisons and 17 of the new Replacement Comparisons were new to the study at the 1992 followup.

CORRECTIONS TO PREVIOUSLY REPORTED STUDY COMPLIANCE TOTALS

Several changes were made to the cell counts shown in Table 5-1 through Table 5-4 so that they now differ from compliance tables presented during previous examination cycles (in particular, Table 5-1 through Table 5-4 of the 1987 Followup Report). The differences fall into two categories:

- Corrections made to the Baseline compliance status of several individuals carried throughout each of the three followup examinations
- Corrections to followup compliance classification errors made during previous reporting cycles.

The following corrections affect the Ranch Hand study compliance reported in Table 5-1.

- The Partial Compliance column (PC) at Baseline decreased from 129 (in the 1987 Followup Report) to 127, and the Refusal column (R) at Baseline increased from 32 (in the 1987 Followup Report) to 34. Two individuals who refused to complete the

Table 5-1.
Baseline Compliance and Followup Disposition of Ranch Hands
at the Baseline, 1985, 1987, and 1992 Examination

Time Period	Disposition	Baseline Compliance					Total
		FC	PC	R	UNL	NS	
Baseline		1,045	127	34	2	--	1,208
Between Baseline & 1985 Followup	New to Study	--	--	--	--	9	9
	Died	(10)	(9)	(0)	(0)	(0)	(19)
1985 Followup	Eligible	1,035	118	34	2	9	1,198
	Contact Attempted	1,035	118	34	2	9	1,198
	Subject Unlocatable	(27)	(12)	(0)	(0)	(0)	(39)
	Refused	(37)	(67)	(29)	(1)	(0)	(134)
	Partially Compliant	--	--	(5)	(0)	(4)	(9)
	Fully Compliant	971	39	0	1	5	1,016
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1985 Followup	Eligible	1,035	118	34	2	9	1,198
Between 1985 & 1987 Followup	New to Study	--	--	--	--	4	4
	Died	(12)	(2)	(1)	(0)	(0)	(15)
1987 Followup	Eligible	1,023	116	33	2	13	1,187
	Contact Attempted	1,023	116	33	2	13	1,187
	Subject Unlocatable	(8)	(10)	(2)	(0)	(0)	(20)
	Refused	(71)	(69)	(27)	(1)	(3)	(171)
	Partially Compliant	--	--	(1)	(0)	(0)	(1)
	Fully Compliant	944	37	3	1	10	995
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1987 Followup	Eligible	1,023	116	33	2	13	1,187
Between 1987 & 1992 Followup	New to Study	--	--	--	--	(0)	(0)
	Died	(35)	(2)	(2)	(0)	(0)	(39)
1992 Followup	Eligible	988	114	31	2	13	1,148
	Contact Attempted	988	114	31	2	13	1,148
	Subject Unlocatable	(5)	(4)	(2)	(1)	(0)	(12)
	Refused	(82)	(75)	(23)	(0)	(4)	(184)
	Partially Compliant	--	--	(0)	(0)	(0)	(0)
	Fully Compliant	901	35	6	1	9	952

FC = Fully Compliant at Baseline.
NS = New to Study Since Baseline.
PC = Partially Compliant at Baseline.
R = Refusal at Baseline.
UNL = Unlocatable at Baseline.
-- = Undefined Categories.

Table 5-2.
Baseline Compliance and Followup Disposition of Comparisons
at the Baseline, 1985, 1987, and 1992 Examination

Time Period	Disposition	Baseline Compliance					Total
		FC	PC	R	UNL	NS	
Baseline		1,224	301	133	9	--	1,667
Between Baseline & 1985 Followup	New to Study	--	--	--	--	73	73
	Died	(16)	(9)	(1)	(0)	(0)	(26)
1985 Followup	Eligible	1,208	292	132	9	73	1,714
	Contact Attempted	1,208	292	132	9	73	1,714
	Subject Unlocatable	(38)	(26)	(0)	(0)	(1)	(65)
	Refused	(31)	(173)	(87)	(5)	(30)	(326)
	Partially Compliant	--	--	(24)	(0)	(6)	(30)
	Fully Compliant	1,139	93	21	4	36	1,293
1985 Followup	Eligible	1,208	292	132	9	73	1,714
Between 1985 & 1987 Followup	New to Study	--	--	--	--	33	33
	Died	(14)	(1)	(1)	(0)	(0)	(16)
1987 Followup	Eligible	1,194	291	131	9	106	1,731
	Contact Attempted	1,194	291	131	9	106	1,731
	Subject Unlocatable	(8)	(20)	(9)	(3)	(7)	(47)
	Refused	(73)	(178)	(88)	(3)	(16)	(358)
	Partially Compliant	--	--	(13)	(0)	(14)	(27)
	Fully Compliant	1,113	93	21	3	69	1,299
1987 Followup	Eligible	1,194	291	131	9	106	1,731
Between 1987 & 1992 Followup	New to Study	--	--	--	--	82	82
	Died	(37)	(8)	(1)	(0)	(5)	(51)
1992 Followup	Eligible	1,157	283	130	9	183	1,762
	Contact Attempted	1,157	283	130	9	183	1,762
	Subject Unlocatable	(9)	(8)	(7)	(3)	(29)	(56)
	No Health Match	--	--	--	--	(11)	(11)
	Refused	(85)	(179)	(95)	(3)	(52)	(414)
	Partially Compliant	--	--	(0)	(0)	(0)	(0)
	Fully Compliant	1,063	96	28	3	91	1,281

FC = Fully Compliant at Baseline.
NS = New to Study Since Baseline.
PC = Partially Compliant at Baseline.
R = Refusal at Baseline.
UNL= Unlocatable at Baseline.
-- = Undefined Categories.

Table 5-3.
Baseline Compliance and Followup Disposition of Original Comparisons
at the Baseline, 1985, 1987, and 1992 Examination

Time Period	Disposition	Baseline Compliance					Total
		FC	PC	R	UNL	NS	
<i>Baseline</i>		<i>936</i>	<i>216</i>	<i>81</i>	<i>3</i>	<i>--</i>	<i>1,236</i>
Between Baseline & 1985 Followup	New to Study	--	--	--	--	17	17
	Died	(11)	(9)	(1)	(0)	(0)	(21)
<i>1985 Followup</i>	<i>Eligible</i>	<i>925</i>	<i>207</i>	<i>80</i>	<i>3</i>	<i>17</i>	<i>1,232</i>
	Contact Attempted	925	207	80	3	17	1,232
	Subject Unlocatable	(28)	(19)	(0)	(0)	(1)	(48)
	Refused	(25)	(127)	(62)	(2)	(3)	(219)
	Partially Compliant	--	--	(8)	(0)	(2)	(10)
	Fully Compliant	872	61	10	1	11	955
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<i>1985 Followup</i>	<i>Eligible</i>	<i>925</i>	<i>207</i>	<i>80</i>	<i>3</i>	<i>17</i>	<i>1,232</i>
Between 1985 & 1987 Followup	New to Study	--	--	--	--	5	5
	Died	(12)	(1)	(0)	(0)	(0)	(13)
<i>1987 Followup</i>	<i>Eligible</i>	<i>913</i>	<i>206</i>	<i>80</i>	<i>3</i>	<i>22</i>	<i>1,224</i>
	Contact Attempted	913	206	80	3	22	1,224
	Subject Unlocatable	(7)	(12)	(9)	(2)	(2)	(32)
	Refused	(51)	(131)	(53)	(1)	(6)	(242)
	Partially Compliant	--	--	(11)	(0)	(0)	(11)
	Fully Compliant	855	63	7	0	14	939
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<i>1987 Followup</i>	<i>Eligible</i>	<i>913</i>	<i>206</i>	<i>80</i>	<i>3</i>	<i>22</i>	<i>1,224</i>
Between 1987 & 1992 Followup	New to Study	--	--	--	--	4	4
	Died	(25)	(6)	(0)	(0)	(2)	(33)
<i>1992 Followup</i>	<i>Eligible</i>	<i>888</i>	<i>200</i>	<i>80</i>	<i>3</i>	<i>24</i>	<i>1,195</i>
	Contact Attempted	888	200	80	3	24	1,195
	Subject Unlocatable	(6)	(4)	(3)	(2)	(2)	(17)
	Refused	(61)	(132)	(64)	(1)	(8)	(266)
	Partially Compliant	--	--	(0)	(0)	(0)	(0)
	Fully Compliant	821	64	13	0	14	912

FC = Fully Compliant at Baseline.
NS = New to Study Since Baseline.
PC = Partially Compliant at Baseline.
R = Refusal at Baseline.
UNL = Unlocatable at Baseline.
-- = Undefined Categories.

Table 5-4.
Baseline Compliance and Followup Disposition of Replacement Comparisons
at the Baseline, 1985, 1987, and 1992 Examination

Time Period	Disposition	Baseline Compliance					Total
		FC	PC	R	UNL	NS	
<i>Baseline</i>		288	85	52	6	--	431
Between Baseline & 1985 Followup	New to Study	--	--	--	--	56	56
	Died	(5)	(0)	(0)	(0)	(0)	(5)
<i>1985 Followup</i>	<i>Eligible</i>	283	85	52	6	56	482
	Contact Attempted	283	85	52	6	56	482
	Subject Unlocatable	(10)	(7)	(0)	(0)	(0)	(17)
	Refused	(6)	(46)	(25)	(3)	(27)	(107)
	Partially Compliant	--	--	(16)	(0)	(4)	(20)
	Fully Compliant	267	32	11	3	25	338
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<i>1985 Followup</i>	<i>Eligible</i>	283	85	52	6	56	482
Between 1985 & 1987 Followup	New to Study	--	--	--	--	28	28
	Died	(2)	(0)	(1)	(0)	(0)	(3)
<i>1987 Followup</i>	<i>Eligible</i>	281	85	51	6	84	507
	Contact Attempted	281	85	51	6	84	507
	Subject Unlocatable	(1)	(8)	(0)	(1)	(5)	(15)
	Refused	(22)	(47)	(35)	(2)	(10)	(116)
	Partially Compliant	--	--	(2)	(0)	(14)	(16)
	Fully Compliant	258	30	14	3	55	360
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<i>1987 Followup</i>	<i>Eligible</i>	281	85	51	6	84	507
Between 1987 & 1992 Followup	New to Study	--	--	--	--	78	78
	Died	(12)	(2)	(1)	(0)	(3)	(18)
<i>1992 Followup</i>	<i>Eligible</i>	269	83	50	6	159	567
	Contact Attempted	269	83	50	6	159	567
	Subject Unlocatable	(3)	(4)	(4)	(1)	(27)	(39)
	No Health Match	--	--	--	--	(11)	(11)
	Refused	(24)	(47)	(31)	(2)	(44)	(148)
	Partially Compliant	--	--	(0)	(0)	(0)	(0)
	Fully Compliant	242	32	15	3	77	369

FC = Fully Compliant at Baseline.
 NS = New to Study Since Baseline.
 PC = Partially Compliant at Baseline.
 R = Refusal at Baseline.
 UNL = Unlocatable at Baseline.
 -- = Undefined Categories.

**Table 5-5.
New Fully Compliant Participants at the 1992 Followup,
by Group and Previous Compliance Status**

Baseline	Previous Compliance		Group		
	1985	1987	Ranch Hand	Original Comparison	Replacement Comparison
Partial	Refusal	Refusal	1	7	4
Partial	Refusal	Unlocated	0	1	0
Partial	Unlocated	Refusal	0	2	0
Refusal	Refusal	Refusal	2	4	4
Refusal	Partial	Refusal	1	1	2
Refusal	Refusal	Unlocated	0	1	0
Refusal	Refusal	Partial	0	1	1
New 85	Refusal	Refusal	0	0	1
New 85	Unlocated	Unlocated	0	1	0
New 85	Refusal	Partial	0	0	3
New 85	Refusal	Unlocated	0	0	2
	New 87	Refusal	0	1	0
	New 87	Partial	0	0	3
		New 92	0	1	17
Total			4	20	37

in-home interview did submit to the long telephone interview and were mistakenly classified as PC at Baseline. The long telephone interview is not a surrogate for the in-home interview. Consequently, these two individual's Baseline compliance codes were changed from PC to R. These two individuals additionally were reclassified as partially compliant at the 1985 followup from refusal at the 1985 followup (in the 1987 Followup Report). One of these two individuals subsequently died between the 1985 followup and the 1987 followup. Other changes in the PC and R columns in Table 5-1 are a result of these corrections.

- At the 1985 followup, the number of unlocatable subjects in the Fully Compliant column (FC) at Baseline decreased from 28 (in the 1987 Followup Report) to 27 and the number of refusals increased from 36 (in the 1987 Followup Report) to 37. This was due to the misclassification of one individual.
- Between the 1985 and 1987 followups, the number of deaths in the FC column at Baseline increased from 11 (in the 1987 Followup Report) to 12 because one of the nine individuals previously reported in the 1987 Followup Report as Unlocatable (UNL) during the 1987 followup was deceased.

The following corrections affect the Comparison study compliance reported in Table 5-2.

- The PC column at Baseline decreased from 307 (in the 1987 Followup Report) to 301, and the R column at Baseline increased from 128 (in the 1987 Followup Report) to 133. Five individuals who refused to complete the in-home interview did submit to the long telephone interview and were mistakenly classified as PC at Baseline. The long telephone interview is not a surrogate for the in-home interview. Consequently these five individual's Baseline compliance codes were changed from PC to R. One of these individuals additionally was reclassified as partially compliant at the 1985 followup from refusal at the 1985 followup (in the 1987 Followup Report). In addition, one other individual classified as PC at Baseline in the 1987 Followup Report was determined to be ineligible as a Comparison and was removed from the study. This person had been mistakenly classified as UNL for the 1985 and 1987 followups (in the 1987 Followup Report). Other changes in the PC and R columns in Table 5-2 are a result of these corrections and corrections in Table 5-4 described below.
- At the 1985 followup, the number of unlocatable subjects in the FC column at Baseline decreased from 39 (in the 1987 Followup Report) to 38 and the number of refusals increased from 30 (in the 1987 Followup Report) to 31. This was due to the misclassification of one individual.
- In the New to Study since Baseline (NS) column, the number of participants new to the study between the 1985 and 1987 followup increased from 32 (in the 1987 Followup Report) to 33. This was due to a classification error. One individual should have been reported as a new Original Comparison and was not. This participant is classified as Unlocatable at the 1987 followup in this report. He was mistakenly omitted from the 1987 Followup Report.
- At the 1987 followup, in the NS column, two individuals who were previously classified as "Contact Not Attempted" (in the 1987 Followup Report) were moved to the "Subject Unlocatable" classification. These changes were due to classification errors. In this same column, one individual reported as a refusal (in the 1987 Followup Report) was reclassified as UNL, correcting a classification error.

All the changes in Tables 5-3 and 5-4 are a result of the changes in Table 5-2, with the exception of the corrections described below.

- Both Original Comparison study compliance in Table 5-3 and Replacement Comparison study compliance in Table 5-4 were affected by an error in the reported 1985 followup compliance status of two individuals in the NS column. This error involved the "trading" of one partially compliant Original Comparison misclassified as a Replacement Comparison at the 1985 followup (in the 1987 Followup Report) with one refusal Replacement Comparison misclassified as an Original Comparison at the 1985 followup (in the 1987 Followup Report). Consequently, in the NS column of Table 5-3, the number of refusal Original Comparisons at the 1985 followup decreased from 4 (in the 1987 Followup Report) to 3, and the number of partially compliant Original Comparisons at the 1985 followup increased from 1 (in the 1987 Followup Report) to 2. Additionally, in the NS column of Table 5-4, the number of

refusal Replacement Comparisons at the 1985 followup increased from 26 (in the 1987 Followup Report) to 27, and the number of partially compliant Refusal Comparisons at the 1985 followup decreased from 5 (in the 1987 Followup Report) to 4. The changes made affect Table 5-3 and Table 5-4, but do not affect Table 5-2.

- In the R column at Baseline in Table 5-4, the number of refusal Replacement Comparisons at the 1985 followup decreased from 26 (in the 1987 Followup Report) to 25, and the number of partially compliant Replacement Comparisons at the 1985 followup increased from 15 (in the 1987 Followup Report) to 16 due to the misclassification of one individual. This change additionally affects Table 5-2.
- In the PC column at Baseline in Table 5-4, the number of refusal Replacement Comparisons at the 1987 followup decreased from 48 (in the 1987 Followup Report) to 47, and the number of unlocatable Replacement Comparisons at the 1987 followup increased from 7 (in the 1987 Followup Report) to 8 due to the misclassification of one individual. This change additionally affects Table 5-2.

REFUSING RANCH HANDS VERSUS REFUSING COMPARISONS

Of the 1,148 Ranch Hands and 1,762 Comparisons eligible for the 1992 followup examination, 184 Ranch Hands and 414 Comparisons chose not to attend. Their reasons for refusal are summarized in Table 5-6. Two new refusal categories were added for the 1992 physical examination: “hostile” and “no health-match.” Hostile refusals accounted for over 30 percent of both refusing Ranch Hands and refusing Comparisons. Hostile refusals included 162 participants who were abusive at previous examinations. These participants, designated by the Air Force as hostile, were not contacted by schedulers during the 1992 scheduling operation. Five individuals did decide on their own to cooperate with the 1992 followup and contacted the Air Force. Eight of these 162 hostile participants were determined to be deceased and one participant was reclassified as unlocatable. In addition, four of these hostile participants were determined to be refusals for other reasons. Consequently, 144 of the 162 participants initially specified as hostile prior to scheduling remained classified as hostile after the scheduling effort. These 144 participants were included as part of the “Contact Attempted” column, although no actual attempt by schedulers was made to contact these participants at the 1992 followup due to their history of abusiveness at previous examinations. Fifty-three refusing participants were found to be “newly” hostile during the 1992 scheduling process, yielding a total of 197 hostile participants.

The “no health-match” refusal category included participants initially contacted as potential Replacement Comparisons but whose perceived health status did not actually match the health status of the Original Comparison he would have replaced. The 11 “no health-match” potential Replacement Comparisons are included in Tables 5-2 and 5-4. Because they were willing to participate, but were rejected by the Air Force, these 11 potential replacements are not shown in Table 5-6 and were not used in the analysis of refusals that follows.

**Table 5-6.
Reason for Refusal, by Group**

Reason	Group			
	Ranch Hand		Comparison	
	Number	Percent	Number	Percent
Fear of Physical Exam	0	0.0	3	0.7
Job Commitment	31	16.8	53	12.8
Dissatisfaction with USAF	6	3.3	10	2.4
No Time	13	7.1	50	12.1
Travel Distance, Family	8	4.3	17	4.1
Confidentiality	1	0.5	2	0.5
Health Reasons	19	10.3	21	5.1
Passive Refusal	41	22.3	96	23.2
Dissatisfaction with Baseline	3	1.6	5	1.2
Financial Hardship	2	1.1	2	0.5
Hostile	58	31.5	139	33.6
Other	2	1.1	16	3.9
Total	184		414	

Table 5-7 summarizes reason for refusal versus group adjusted for age and rank. Reason for refusal was collapsed to four categories: logistic (job commitment, no time or interest, travel distance or family constraints, confidentiality, or financial hardship); passive (passive refusal); hostile (hostile refusal); and other (fear of physical examination, dissatisfaction with the U.S. Air Force, health reasons, dissatisfaction with Baseline, or other reason). Age and rank were dichotomized for analysis purposes (born before 1942 and born in or after 1942; officer and enlisted respectively). Due to small cell counts, military occupation could not be accommodated. Forty Blacks (10 Ranch Hands and 30 Comparisons) were deleted due to cell counts too small to support analysis.

A test of association between reason for refusal and group (adjusted for age and rank) was performed and found to be not significant ($p=0.85$). The adjusted association between reason for refusal and age was significant ($p=0.002$), as was the association between reason for refusal and rank ($p=0.005$) for both groups (Ranch Hand, Comparison) combined. There were more hostile officers (42.9%) than enlisted (32.4%) among older participants but the difference is even greater between hostile officers (42.7%) and enlisted (24.7%) in the younger participants.

Of the 598 refusals, reported health status was available for a total of 307 Ranch Hands and Comparisons. Table 5-8 summarizes their responses. Reported health status was obtained by telephone at the time of scheduling. Data were obtained from 95 (51.6%) of 184 refusing Ranch Hands and 212 (51.2%) of 414 refusing Comparisons. Of the 307

Table 5-7.
Reason for Refusal Versus Group, Adjusted for Age and Rank Among Non-Blacks

Birth Year	Rank	Group	Reason for Refusal								Total
			Logistic		Passive		Hostile		Other		
			n	%	n	%	n	%	n	%	
< 1942	Officer	RH	12	28.6	7	16.7	18	42.9	5	11.9	42
		C	15	17.9	20	23.8	36	42.9	13	15.5	84
		Total	27	21.4	27	21.4	54	42.9	18	14.3	126
	Enlisted	RH	13	25.5	10	19.6	13	25.5	15	29.4	51
		C	28	29.8	15	16.0	34	36.2	17	18.1	94
		Total	41	28.3	25	17.2	47	32.4	32	22.1	145
≥ 1942	Officer	RH	7	41.2	3	17.6	5	29.4	2	11.8	17
		C	18	25.0	15	20.8	33	45.8	6	8.3	72
		Total	25	28.1	18	20.2	38	42.7	8	9.0	89
	Enlisted	RH	22	34.4	18	28.1	18	28.1	6	9.4	64
		C	56	41.8	33	24.6	31	23.1	14	10.4	134
		Total	78	39.4	51	25.8	49	24.7	20	10.1	198
Grand Total			171	30.6	121	21.7	188	33.7	78	14.0	558

RH = Ranch Hand.
C = Comparison.

Table 5-8.
Reported Health Status of Refusals at the 1992 Followup

Reported Health Status	Group					
	Ranch Hand		Comparison		Total	
	Number	Percent	Number	Percent	Number	Percent
Excellent	31	32.6	85	40.1	116	37.8
Good	43	45.3	108	50.9	151	49.2
Fair	16	16.8	13	6.1	29	9.4
Poor	5	5.3	6	2.8	11	3.6
Total	95		212		307	

refusals responding to the health status question, there was a significant association between group and reported health ($p=0.02$). More Ranch Hands reported fair or poor health whereas more Comparisons reported excellent or good health. This trend agrees with results from the 1987 followup but group differences are more pronounced in 1992. A larger percentage of refusing Comparisons (40.1%) reported excellent health than refusing Ranch Hands (32.6%) and a larger percentage of refusing Ranch Hands (16.8%) reported fair health than refusing Comparisons (6.1%).

Ideally, compliance bias between the groups should be assessed by comparing the health of refusing participants to fully compliant participants with adjustment for the matching variables. The only current data available on the refusing participants are responses to the health status question asked during the scheduling procedure. These data are missing almost entirely for hostile refusals. Health status data are available for only 32 hostile refusals. A test of association between reported health status and group adjusted for compliance, age, and rank was performed, and the results appear in Table 5-9. For analysis purposes, reported health status was collapsed to two categories: excellent or good, and fair or poor. The covariates age and rank were dichotomized (born before 1942 and born in or after 1942 and officer and enlisted). Military occupation (flying or ground duty) could not be accommodated due to small cell counts. Blacks ($n=170$) were excluded from the analysis due to small cell counts.

The association between reported health status and group, adjusted for compliance, age, and rank, was significant ($p=0.007$). As seen in Table 5-9, except for the sparse younger officer refusal data, Ranch Hands consistently reported poorer health than Comparisons. Relatively sparse refusal data also may account for the large group differences in reported health status observed for older enlisted refusals. The adjusted association between reported health status and compliance was statistically significant ($p=0.02$). The 1987 analysis suggested that, in general, those who refused to participate reported poorer health more often than did their fully compliant counterparts. For 1992, reporting of poorer health by refusers appears to have held true for older, but not necessarily for younger, participants. Table 5-9 shows that for older officer participants, 91.8 percent of the fully compliant Ranch Hands and 93.3 percent of the fully compliant Comparisons reported excellent or good health, while 84.2 percent of the refusing Ranch Hands and 85.3 percent of the refusing Comparisons reported excellent or good health. A similar pattern holds for older enlisted participants. On the other hand, younger refusals seem to be reporting better health than younger fully compliant participants. It is of interest to note that Ranch Hands reported poorer health more often than Comparisons among both fully compliant and refusing participants. Significant associations also were found between reported health status and both rank ($p<0.001$) and age ($p<0.001$). Table 5-9 shows that officers consistently reported better health than enlisted participants and, as expected, younger participants reported better health than older participants.

REPLACEMENT COMPARISONS VERSUS THE NONCOMPLIANT ORIGINAL COMPARISONS THEY REPLACED

As initiated at the 1985 followup, matching replacements for refusing Original Comparisons on the basis of health status as well as age, race, rank, and occupation was

Table 5-9.
Reported Health Status versus Group, Adjusted for Compliance,
Age, and Rank Among Non-Blacks

Compliance	Birth Year	Rank	Group	Reported Health Status				Total	
				Excellent or Good		Fair or Poor			
				n	%	n	%		
Fully Compliant	< 1942	Officer	RH	259	91.8	23	8.2	282	
			C	348	93.3	25	6.7	373	
		Enlisted	RH	191	78.0	54	22.0	245	
			C	257	83.2	52	16.8	309	
	≥ 1942	Officer	RH	77	96.3	3	3.8	80	
			C	121	98.4	2	1.6	123	
		Enlisted	RH	248	87.9	34	12.1	282	
			C	354	89.8	40	10.2	394	
		Total			1,855	88.8	233	11.2	2,088
		Refused	< 1942	Officer	RH	16	84.2	3	15.8
C	29				85.3	5	14.7	34	
Enlisted	RH			15	55.6	12	44.4	27	
	C			45	83.3	9	16.7	54	
≥ 1942	Officer		RH	7	100.0	0	0.0	7	
			C	31	100.0	0	0.0	31	
	Enlisted		RH	33	91.7	3	8.3	36	
			C	76	96.2	3	3.8	79	
Total			252	87.8	35	12.2	287		

maintained at the 1992 followup. The reported health status of new replacements was obtained at the time of telephone scheduling.

At the 1992 followup, an attempt was made to contact a total of 78 potential replacements new to the study since the Baseline (see Table 5-4). Seventeen of the 78 replaced refusing Original Comparisons. The health-matching replacement strategy for the 17 newly matched replacements and their replaced Originals in 1992 is summarized in Table 5-10.

All 17 matched replacements reported excellent or good health. Ten of these replacements were correctly matched to refusing Originals, four with excellent health and six with good health, as required in the Study Protocol. Seven Original Comparisons (labeled "Unknown") either refused to give a self-perception of health or said they did not know how their health compared with that of others. Replacements with excellent or good health were matched to these seven refusing Original Comparisons, as shown in Table 5-10.

Table 5-10.
Reported Health Status of Replaced Originals and Their Matched Replacements
at the 1992 Followup

Replacement's Reported Health	Original Comparison's Reported Health					Total
	Excellent	Good	Fair	Poor	Unknown*	
Excellent	4	0	0	0	1	5
Good	0	6	0	0	6	12
Fair	0	0	0	0	0	0
Poor	0	0	0	0	0	0
Total	4	6	0	0	7	17

* Subject refused to give perception of health or stated "I don't know."

At the 1992 followup (see Table 5-3), 283 Original Comparisons were noncompliant. The entire matched set of replacement candidates for each noncompliant Original Comparison was reviewed to determine if the appropriate replacement strategy was followed. Results are presented in Table 5-11. Of the 283 noncompliant (refusing or unlocatable) Original Comparisons at the 1992 followup, all but 64 were members of matched sets having at least one other compliant Replacement Comparison. Of the 64, 21 were noncompliant Original Comparisons whose potential replacements were never contacted, and 43 were members of matched sets in which all contacted potential replacements were noncompliant and at least one other potential replacement was not contacted. Exactly how many of the 64 noncompliant Original Comparisons belonged to matched sets containing a health-matched replacement is unknown because current health status could only be obtained from contacted participants.

REPORTED HEALTH IN FULLY COMPLIANT PARTICIPANTS

Partial compliance, which occurred when a participant answered the Baseline questionnaire but had no corresponding physical examination performed, could not be compared with full compliance for 1992 because all questionnaires were given to participants at the site of the physical examination (although, an unusual instance did occur when two Comparisons completed the physical examination but refused the questionnaire). Therefore, Tables 5-12 through 5-14 summarize data on the health status, medication use, and work loss of the 2,233 fully compliant participants at the 1992 followup. Health status and work-loss patterns appear similar to 1987 responses, but nearly half of the fully compliant participants now take medication on a regular basis compared to 25 percent in 1987.

Table 5-12 summarizes the reported health status of participants fully compliant to the 1992 physical examination. Among fully compliant participants, no significant association was found between reported health and group (Ranch Hand, Comparison) ($p=0.24$). A marginally significant association was found between reported use of medication and group ($p=0.08$). As seen in Table 5-13, a greater percentage of Ranch Hands (44.1%) reported medication use than Comparisons (40.4%). Table 5-14 shows how many fully compliant Ranch Hands and Comparisons reported work loss. No significant association was found between work loss and group ($p=0.18$).

Table 5-11.
Matched Set Compliance of 283 Noncompliant Original Comparisons

Matched Set Compliance	Original Comparison's Compliance		
	Refusal	Unlocatable	Total
At Least One Compliant Replacement	207	12	219
All Contacted Replacements Noncompliant and Other Uncontacted Comparisons Remain in the Matched Set	41	2	43
No Comparisons Contacted	18	3	21
Total	266	17	283

Table 5-12.
Reported Health, as Obtained During the Scheduling Procedure, of Fully Compliant Participants at the 1992 Followup

Reported Health	Group				Total	Percent
	Ranch Hand		Comparison			
	Number	Percent	Number	Percent		
Excellent	350	37.0	511	40.2	861	38.8
Good	474	50.2	629	49.4	1,103	49.8
Fair	96	10.2	105	8.3	201	9.1
Poor	25	2.6	27	2.1	52	2.3
Total	945*		1,272**		2,217	

* Seven Ranch Hands did not answer.

** Nine Comparisons did not answer.

Table 5-13.
Reported Medication Use of Fully Compliant Participants at the 1992 Followup

Medication Use	Group				Total	Percent
	Ranch Hand		Comparison			
	Number	Percent	Number	Percent		
Yes	420	44.1	516	40.4	936	42.0
No	532	55.9	762	59.6	1,294	58.0
Total	952		1,278*		2,230	

* Three Comparisons skipped this question.

**Table 5-14.
Reported Work Loss of Fully Compliant Participants at the 1992 Followup**

Work Loss	Group				Total	Percent
	Ranch Hand		Comparison			
	Number	Percent	Number	Percent		
Yes	136	17.5	163	15.2	299	16.2
No	640	82.5	908	84.8	1,548	83.8
Total	776		1,071		1,847*	

* Does not include 168 retired, 27 unemployed, 189 participants who skipped this question, and 2 participants who completed the physical exam only.

ANALYSIS OF PASSIVE REFUSALS

A potential participant was identified as a passive refusal if he was scheduled for a physical examination but broke the appointment. Passive refusal was the most common type of refusal (second only to hostile attitude) during the 1992 study. Twenty-two percent of the refusing Ranch Hands and 23 percent of refusing Comparisons were passive refusals (see Table 5-6). More than half (54%) of the passive refusals did not give their reported health status during scheduling.

A summary of reported health status for passive refusals can be found in Table 5-15. No significant association between group (Ranch Hand, Original Comparison, Replacement Comparison) and reported health status was found ($p=0.55$). Additionally, health status was collapsed to excellent or good and fair or poor, and group was collapsed to Ranch Hand and Comparison because of sparse data. Analysis of the collapsed table revealed no significant association between group and reported health status ($p=0.56$).

CONCLUSION

These compliance analysis results suggest that Ranch Hands may be experiencing poorer reported health than Comparisons even after accounting for rank, age, and compliance differences. These group differences in self-perception of health are present for both fully compliant participants and refusing participants.

Despite requirements in the Study Protocol, 64 of 283 noncompliant Original Comparisons were not replaced as they should have been by compliant replacements at the 1992 followup. If all 64 noncompliant Original Comparisons had been replaced, the total number of fully compliant study participants (2,233 for the 1992 followup) would have increased by less than 3 percent. It is not known how many of the 64 had potential health-matched replacements in their matched set, but any biasing effect is considered negligible.

**Table 5-15.
Reported Health Status of Passive Refusals at the 1992 Followup**

Reported Health	Group						Total	Percent
	Ranch Hand		Original Comparison		Replacement Comparison			
	Number	Percent	Number	Percent	Number	Percent		
Excellent	9	45.0	7	33.3	11	50.0	27	42.9
Good	10	50.0	13	61.9	8	36.4	31	49.2
Fair	1	5.0	0	0.0	2	9.1	3	4.8
Poor	0	0.0	1	4.8	1	4.5	2	3.2
Total	20		21		22		63*	

* 74 passive refusals did not answer this question at scheduling.

CHAPTER 5

REFERENCES

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