

CHAPTER 2

POPULATION

This chapter provides a description of participant selection, the enrollment process, and the demographic characteristics of the population that participated in the clinical and questionnaire portions of the first followup morbidity study in 1985.

BASELINE CANDIDATE IDENTIFICATION

The study population for the first followup was defined by the Air Force investigators as part of the Baseline study design. Using detailed searches through Air Force and other Government record systems, a total of 1,264 personnel who had participated in Operation Ranch Hand was identified. Using the same historical data sources, a Comparison population of 24,971 individuals that had been assigned to a variety of military cargo missions in Southeast Asia during the same time period was identified.

The Ranch Hand and the Comparison populations were matched after all individuals who had been killed in the Vietnam conflict were removed. The matching process was conducted using a computer program employing iterative nearest-neighbor statistical techniques in order to associate each Ranch Hand with 10 Comparisons by race (Black/nonblack), closest date of birth, and occupational category during Vietnam service (officer-pilot, officer-navigator, officer-nonflying, enlisted flyer, and enlisted groundcrew). For each Ranch Hand, 1 of the 10 matched Comparisons was selected at random and designated the Original Comparison. The resulting exposed and multiple matched Comparison study design was used for the Baseline effort.

During the questionnaire administration of the Baseline study, it was discovered that 18 percent of the Comparison population had been misselected with respect to their Southeast Asia military experience. After eliminating these ineligible Comparisons, the remaining Comparison set was collapsed to a 1:8 study design, which was used for all subsequent eligibility determinations.

During the course of the Baseline morbidity study, five new Ranch Hands were verified as eligible for the study and were added to the exposed group. In addition, two Ranch Hands who had been misclassified as Comparisons were identified during the questionnaire administration. These individuals were reclassified as exposed and new Comparisons were assigned appropriately. Following the completion of the Baseline morbidity study, 10 additional Operation Ranch Hand participants were located and added to the study population for the followup phases.

FOLLOWUP CANDIDATE IDENTIFICATION

One of the preliminary tasks associated with the followup study was to conduct a telephone survey of uncontacted replacement candidates. The purpose of the survey was to obtain new information on the candidate's general health, economic situation, and willingness to participate in the study.

The Air Force address file, assembled and maintained since 1981, provided the basis for the telephone survey contact list. A location algorithm described in Chapter 3 was developed in order to find those individuals no longer at the address and telephone number indicated in the Baseline file.

A total of 7,411 candidate replacements out of the candidate file of 7,963 was located, interviewed using computer-aided telephone interview (CATI) techniques, and confirmed as eligible candidate study participants. Of the 552 candidates who could not be interviewed, 26 were deceased, 335 refused, 190 were unlocatable, and 1 respondent had not served in Southeast Asia and was therefore ineligible for the study.

Table 2-1 provides the number of candidate participants by Baseline compliance category for the Ranch Hand and Comparison groups.

PARTICIPANT SELECTION

The participant selection protocol used for the followup was similar to that used at Baseline with one important exception. If the Original Comparison declined to participate, the next randomly ordered candidate for the corresponding Ranch Hand with the same self-perception of health was contacted and recruited for the study. This matching process was not feasible at Baseline because the addresses of the Comparison pool were not fully ascertained. Perception of health was subjectively determined by the candidate during the telephone interview. The rationale for matching replacement Comparisons on self-perceived health status was an attempt to minimize any bias that might result from differential compliance. All candidates who had been contacted and invited to participate during the Baseline, including those who were refusals and partial compliers, were contacted and invited to the followup along with newly verified or located Ranch Hands and their Comparisons.

ENROLLMENT

The enrollment of candidates was based on the Baseline lists and health status information from the telephone survey. Recruitment was conducted for questionnaire interviews and clinical examinations that began in May 1985 and ended in March 1986. Approximately 70 individuals were examined each week in two groups of 35. A total of 2,309 Ranch Hands and Comparisons participated in both the questionnaire and clinical examination portions of the AFHS followup. Since the followup questionnaire was administered at the physical examination site, there were no "partially compliant" participants at followup.

TABLE 2-1.

Candidate Followup Participants by Group and
Baseline Compliance Status

Number	Category
<u>Candidate Ranch Hands (by Baseline Status)</u>	
1,045	Ranch Hands Who Completed Both Baseline Questionnaire and Physical Examination (Fully Compliant)
129	Ranch Hands Who Completed Only Baseline Questionnaire (Partially Compliant)
32	Ranch Hands Who Declined to Take Part in Baseline (Noncompliant)
10	Newly Verified or Located Ranch Hands
1,216	Total
<u>Candidate Comparisons (by Baseline Status)</u>	
936	Original Comparisons Who Completed Both Baseline Questionnaire and Physical Examination (Fully Compliant)
220	Original Comparisons Who Completed Only Baseline Questionnaire (Partially Compliant)
79	Original Comparisons Who Declined to Take Part in Baseline (Noncompliant)
288	Replacement Comparisons Who Completed Both Baseline Questionnaire and Physical Examination (Fully Compliant)
88	Replacement Comparisons Who Completed Only Baseline Questionnaire (Partially Compliant)
49	Replacement Comparisons Who Declined to Take Part in the Study (Noncompliant)
7,411	Replacement Comparisons Who Had Not Been Contacted Previously
9,071	Total

Enrollment was managed using an automated scheduling and tracking system to maintain and record all candidate recruitment contacts, actions, and status; clinical examination group scheduling; schedule modifications, cancellations, and completions; and a comprehensive set of logistic management reports. An effort was made to successfully recruit every individual eligible for the study. The number of participants who participated in the physical examination and questionnaire of the first followup is provided in Table 2-2.

Of the 1,016 Ranch Hands, all but 53 had matched Comparisons who also participated in the study. Due to the selection strategy used and the recruitment of previous noncompliers, several of the Ranch Hands had multiple Comparisons. The selection strategy resulted in 79 Ranch Hands having 2 Comparisons, 9 having 3 Comparisons, and 1 Ranch Hand having a total of 5 Comparisons completing the followup. In accordance with the Study Protocol, eligible Comparisons were enrolled without regard to the compliance status of the corresponding Ranch Hand. There were 229 Comparisons in the followup study whose matched Ranch Hand did not participate.

PERSONAL CHARACTERISTICS AND HABITS OF FOLLOWUP POPULATION

The data on personal characteristics of the Ranch Hand and Comparison individuals were obtained from the followup questionnaire. The areas of tobacco, alcohol, and marijuana use; personal and family income; education; religious preference; active duty/retired/separated status; and risk-taking behavior received particular attention. These variables were examined to assess the similarity of the two groups in social and behavioral characteristics, which were not included in the statistical matching process.

The participants in the study were matched on age. The age characteristics of the study population are shown in Table 2-3. The mean and median ages of the Ranch Hand and Comparison groups were nearly identical.

The smoking and alcohol-use habits of the study subjects are displayed in Table 2-4. More participating Ranch Hands smoked cigarettes at the time of the followup physical examination than did the Comparisons (40.1% versus 35.0%). This difference in current smoking behavior was statistically significant ($p=0.01$). In the intervening years since the Baseline examination, 5.6 percent of the Ranch Hands and 4.6 percent of the Comparisons had stopped smoking. The proportions of participants who ever smoked cigarettes, pipes, or cigars were not significantly different in the two groups. Similarly, the number of participants who drank alcohol in the years since 1982 was not statistically different between groups.

Data concerning the use of marijuana were gathered by different methods in the two interviews. In the Baseline questionnaire in 1982, confidentiality of response was given to all participants, but answers were identifiable for each participant. At the 1985 followup, random response techniques¹ were used on the marijuana questions to overcome the problem of participants either refusing to respond or giving misleading replies to these highly sensitive and personal questions. With this technique, a coin was flipped by the respondent, who then answered either the marijuana question or a neutral unrelated question, which had an answer of known probability. The outcome of

TABLE 2-2.

Participants Enrolled in the Followup Study by Group and
Baseline Compliance Status

Number	Category
<u>Enrolled Ranch Hands (by Baseline Status)</u>	
971	Ranch Hands Who Completed Both Baseline Questionnaire and Physical Examination (Fully Compliant)
39	Ranch Hands Who Completed Only Baseline Questionnaire (Partially Compliant)
0	Ranch Hands Who Declined to Take Part in Baseline (Noncompliant)
6	Newly Verified or Located Ranch Hands
1,016	Total
<u>Enrolled Comparisons (by Baseline Status)</u>	
872	Original Comparisons Who Completed Both Baseline Questionnaire and Physical Examination (Fully Compliant)
61	Original Comparisons Who Completed Only Baseline Questionnaire (Partially Compliant)
10	Original Comparisons Who Declined to Take Part in Baseline (Noncompliant)
12	New Original Comparisons
267	Replacement Comparisons Who Completed Both Baseline Questionnaire and Physical Examination (Fully Compliant)
32	Replacement Comparisons Who Completed Only Baseline Questionnaire (Partially Compliant)
11	Replacement Comparisons Who Declined to Take Part in Baseline (Noncompliant)
28	New Replacement Comparisons
1,293	Total

TABLE 2-3.

Age (in 1985) of
Participants of the Followup Examination by Group

Age Category	Group			
	Ranch Hand		Comparison	
	Number	Percent	Number	Percent
43 or Less	412	40.6	549	42.5
44 to 62	568	55.9	693	53.6
63 or More	36	3.5	51	3.9
Total	1,016	100.0	1,293	100.0

	Group	
	Ranch Hand	Comparison
Range	35-72 Years	35-77 Years
Mean	46.9 Years	46.8 Years
Median	47 Years	46 Years

the coin flip was unknown to the interviewer. Thus, no given reply could be traced, although the proportion of the population that had the sensitive characteristic (marijuana use) could be estimated.

There were no statistically significant differences between the Ranch Hand and Comparison groups in the reported use of marijuana in the 30 days preceding the examination (7.8% and 9.2%, respectively). A much higher percentage, 26.3 percent of the Ranch Hands and 31.0 percent of the Comparisons, reported smoking marijuana at some time in the past. At Baseline, only 5.1 percent of each group reported ever using marijuana. These differences over time were most likely due to a greater sense of confidentiality generated by the random response techniques used in the 1985 questionnaire.

The mean usage levels of tobacco and alcohol among those participants who did indulge in these habits are shown in Table 2-5 as pack-years, cigar-years, pipe-years, or drink-years. Mean alcohol use per day was 6.26 drinks per day for the Ranch Hands and 6.42 for the Comparisons. In most of the cumulative measurements, the median level of use was lower than the mean level, indicating that the heavy users of these substances skewed the distributions. Eighty-nine percent of both groups reported having consumed alcohol since the last physical examination. Differences in these calculated variables might have been due to either actual changes in behavior or to differences in the questionnaires used to collect the basic data.

TABLE 2-4.

**History of Tobacco and Alcohol Use
of Participants of the Followup Examination by Group**

Habit	Group								p-Value
	Ranch Hand				Comparison				
	Yes	Percent	No	Percent	Yes	Percent	No	Percent	
Current Use of Cigarettes	407	40.1	609	59.9	453	35.0	840	65.0	0.01
Past History of Cigarettes	752	74.0	264	26.0	944	73.0	349	27.0	0.58
Past History of Cigar Use	249	24.5	767	75.5	345	26.7	948	73.3	0.24
Past History of Pipe Use	265	26.1	751	73.9	340	26.3	953	73.7	0.92
Past History of Marijuana Use*		26.3		73.7		31.0		69.0	0.15
Marijuana Use* within Past 30 Days		7.8		92.2		9.2		90.8	0.52
Use of Alcohol since Last Interview	901	88.7	115	11.3	1,147	88.7	146	11.3	0.98

*Estimates based on random response technique.

TABLE 2-5.

**Average Use of Tobacco Products and Alcohol
for Those Reporting Use of These Substances:
Participants of the Followup Examination by Group**

Substance	Group			
	Ranch Hand		Comparison	
	Mean	Median	Mean	Median
Cigarettes per Day (Current Use)	26.54	25.00	25.77	25.00
Cigarettes, Pack-Years (Cumulative)	17.69	13.00	17.61	13.00
Cigar-Years (Cumulative)	11.25	1.30	10.96	1.00
Pipe-Years (Cumulative)	20.03	6.10	16.90	4.00
Alcohol Drinks per Day (Current Use)	6.26	6.00	6.42	5.00
Drink-Years (Since Last Interview)	1.81	0.80	1.89	0.74
Drink-Years (Cumulative)	26.59	12.80	25.04	13.00

Educational background and religious preference for the two groups are presented in Tables 2-6 and 2-7. The current military status of each individual was classified as active duty, retired, separated, reserve duty, or deceased. There were no significant differences between the two groups. These data are presented in Table 2-8 and showed equivalence of the two groups in these social variables.

Data on income were collected in a categorical form, and the median income levels of the Ranch Hand and Comparison groups were comparable. The median personal income in both groups was in the \$25,000 to \$30,000 range, and the median total family income ranged from \$40,000 to \$45,000 in each group.

Risk-taking behavior patterns of the study population were assessed by a series of questions that emphasized participation in potentially dangerous recreational activities. These data are summarized in Table 2-9. In motor-vehicle racing (automobiles, boats, and motorcycles) and scuba diving, there were group differences of borderline significance ($p=0.07$ and $p=0.09$, respectively). Slightly more Comparisons were scuba divers (12.4% versus 10.1%), and more Ranch Hands raced motor vehicles (12.9% versus 10.4%). There was a significant difference in scuba diving at Baseline ($p=0.04$), when more Comparisons were scuba divers (12.7% versus 9.9%).

TABLE 2-6.

Educational Background of Participants of the
Followup Examination by Group

Educational Level	Group			
	Ranch Hand		Comparison	
	Number	Percent	Number	Percent
High School/GED	522	51.4	655	50.7
Associate Degree	84	8.3	114	8.8
BA/BS Degree	194	19.1	271	21.0
Graduate Degree	203	20.0	239	18.5
Unknown	13	1.3	14	1.1
p=0.64				

TABLE 2-7.

Religious Preference of Participants of the
Followup Examination by Group

Religious Preference	Group			
	Ranch Hand		Comparison	
	Number	Percent	Number	Percent
Protestant	671	66.0	856	66.2
Catholic	215	21.2	281	21.7
Jewish	9	0.9	15	1.2
Other	37	3.6	54	4.2
None	84	8.3	87	6.7
p=0.60				

TABLE 2-8.

Military Status of Participants of the
Followup Examination by Group

Military Status	Group			
	Ranch Hand		Comparison	
	Number	Percent	Number	Percent
Active Duty	89	8.8	118	9.1
Retired	553	54.4	683	52.8
Separated	313	30.8	420	32.5
Reserve Forces	55	5.4	65	5.0
Deceased ^a	6	0.6	7	0.5

p=0.90

^aDied after the followup examination.

These data reflected the overall equivalence of the two groups in social and behavioral characteristics. The differences observed when these data were contrasted to similar data at Baseline might have reflected differences in data collection methods or slight changes in the cohorts rather than changes in behavior among group members.

LONGITUDINAL LOSSES AND GAINS

A total of 2,269 Ranch Hands and Comparisons was fully compliant with the Baseline study. The study population of 2,309 for the followup included a loss of 159 participants and the addition of 199 individuals.

Loss to the followup occurred either because the participant was deceased, refused to participate, or was unlocatable. The loss to followup was 7 percent in both the Ranch Hand and Comparison groups. Of the 69 Comparisons lost to the followup study due to refusal or inability to locate, 17 were replaced. For the remaining 52, no replacement who satisfied the health status matching criterion and was willing to participate was identified from the candidate replacements. The categories of these individuals are provided in Table 2-10. A total of 199 new participants were recruited into the study based on the selection methodology used. Information on the new participants is provided in Table 2-10.

TABLE 2-9.

Risk-Taking Behavior of Participants of the
Followup Examination by Group

Activity	Group								p-Value
	Ranch Hand				Comparison				
	Yes	Percent	No	Percent	Yes	Percent	No	Percent	
Scuba Diving	103	10.1	913	89.9	160	12.4	1,133	87.6	0.09
Auto, Boat, or Motorcycle Racing	131	12.9	885	87.1	135	10.4	1,158	89.6	0.07
Acrobatic Flying	43	4.2	973	95.8	43	3.3	1,250	96.7	0.25
Sky Diving	22	2.2	994	97.8	32	2.5	1,261	97.5	0.62
Hang Gliding	11	1.1	1,005	98.9	14	1.1	1,279	98.9	1.00
Mountain Climbing	82	8.1	934	91.9	102	7.9	1,191	92.1	0.86
Surfboard Riding	81	8.0	935	92.0	91	7.0	1,202	93.0	0.40
Long-Distance Sailing	54	5.3	962	94.7	55	4.3	1,238	95.7	0.23
Fast Downhill Skiing*	170	16.7	846	83.3	184	14.2	1,108	85.8	0.10

p=0.10

*One Comparison was unwilling to respond.

TABLE 2-10.

Losses/Gains of Participants Between the
Baseline and Followup Examinations

Losses	
Number	Category
10	Ranch Hands Deceased
59	Ranch Hand Refusals
5	Ranch Hands Unlocatable
74	Total Ranch Hands Lost
16	Comparisons Deceased
55	Comparison Refusals
14	Comparisons Unlocatable
85	Total Comparisons Lost
Gains	
Number	Category
39	Ranch Hands Partially Compliant at Baseline
6	Newly Verified or Located Ranch Hands
45	Total Ranch Hands Added to Study
61	Partially Compliant Original Comparisons at Baseline
32	Partially Compliant Replacement Comparisons at Baseline
11	Newly Selected Original Comparisons (For Newly Verified Ranch Hands)
16	Replacements for Compliant Comparisons Who Refused Followup
10	Noncompliant Original Comparisons Who Agreed to Attend Followup
11	Noncompliant Replacement Comparisons Who Agreed to Attend Followup
1	Original Comparison Not Locatable at Baseline but Found at Followup
3	Replacement Comparisons Not Locatable at Baseline but Found at Followup
9	Replacement Comparisons Not Contacted at Baseline
154	Total Comparisons Added to Study

SUMMARY

Participants were recruited for the first followup in accordance with the Study Protocol. All participants (Ranch Hands and Comparisons) who were contacted for enrollment at Baseline were recruited for this phase of the study. Newly verified and located Ranch Hands, since Baseline, and their respective Comparisons were invited to join the study. Due to refusals among the Comparisons, replacements from the previously uncontacted Comparisons were selected for enrollment. The replacements were matched to the refusing Comparisons on self-perception of health; health status data were obtained in the telephone survey.

Personal characteristics of the two groups were compared, based on data obtained from the followup questionnaire. Contrasts of age, educational background, religious preference, current military status, and income revealed no significant differences between the Ranch Hand and Comparison groups. Significantly more Ranch Hands smoked cigarettes at the time of the followup examination than did Comparisons, although there were no significant differences found for past history of cigarettes, cigars, or pipe use or for recent or past use of marijuana. A much higher percentage of both groups reported smoking marijuana at some time in the past at the followup than at Baseline. This difference was most likely due to a greater sense of confidentiality generated by the random response techniques used in 1985. The use of alcohol since the Baseline examination was not significantly different between the two groups. The difference in the risk-taking behavior patterns of the Ranch Hands and the Comparisons was marginally significant. Slightly more Ranch Hands than Comparisons raced motor vehicles, and more Comparisons were scuba divers.

The followup study population included the loss of 159 participants (74 Ranch Hands and 85 Comparisons) who were fully compliant at Baseline and the addition of 199 participants (45 Ranch Hands and 154 Comparisons). The 199 newly examined study subjects consisted of 132 participants (39 Ranch Hands, 61 Original Comparisons, and 32 replacement Comparisons) who were partially compliant at Baseline, 21 participants (10 Originals and 11 replacements) who refused at Baseline, and 46 participants (6 Ranch Hands, 12 Originals, and 28 replacements) who were new to the study.

Thus, the study population for the first followup of the AFHS consisted of 2,309 individuals: 1,016 who had been associated with Operation Ranch Hand and 1,293 Comparisons.

CHAPTER 2

REFERENCES

1. Greenberg, B.G., A-L.A. Abdul-Ela, W.R. Simmons, and D.G. Horvitz.
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