

Development of a Life Events/Icon Calendar Questionnaire to Ascertain Occupational Histories and Other Characteristics of Migrant Farmworkers

Shelia Hoar Zahm, scD,^{1*} Joanne S. Colt, MS, MPH,¹ Lawrence S. Engel, PhD,¹
Matthew C. Keifer, MD,² Andrew J. Alvarado, EdD,³ Keith Burau, PhD,⁴
Patricia Butterfield, PhD,⁵ Soledad Caldera,³ Sharon P. Cooper, PhD,⁴
Deliana Garcia,⁶ Craig Hanis, PhD,⁴ Edward Hendrikson, PhD,⁷ Nicholas Heyer, PhD,²
Linda M. Hunt, PhD,⁸ Michelle Krauska,⁹ Nancy MacNaughton,⁴
Cheryl J. McDonnell, PhD,¹⁰ Paul K. Mills, PhD,¹¹ L. Diane Mull,¹²
David L. Nordstrom, PhD,¹³ Beth Outtersen,¹² Doris P. Slesinger, PhD,¹⁴
Mary Ann Smith, PhD,⁴ Lorann Stallones, PhD,¹⁵ Claudia Stephens,¹⁶
Anne Sweeney, PhD,⁴ Kimberley Sweitzer, PhD,¹⁵ Sally W. Vernon, PhD,⁴
and Aaron Blair, PhD¹

Background *Specialized methods are necessary to collect data from migrant farmworkers for epidemiologic research.*

Methods *We developed a questionnaire that collected lifetime occupational histories and other lifestyle risk factors via a life events/icon calendar, and administered the questionnaire to a convenience sample of 162 migrant farmworkers in nine areas of the U.S.*

Results *The average duration of the interviews was about 1 h 30 min, with an average of 45 min for the work history section. The occupational histories covered a median of 27.6 years per person for men and 20.8 years per person for women. The median number of years spent in farm jobs was 11.3 for men and 5.8 for women. The median number of farm jobs (crop/task combination) per person was 59 among men and 27 among women. Many farmworkers performed the same crop/task combinations at multiple times throughout their lives, yielding a median of 13 unique farm jobs and 8 unique crops among men and 7 jobs and 5 crops among women.*

Conclusions *The project demonstrated that it is feasible to collect detailed work histories and other risk factor data from farmworkers, documented the complexity of work histories encountered among farmworkers, and yielded recommendations for refining a questionnaire that will facilitate future epidemiologic research on farmworkers.* Am. J. Ind. Med. 40:490–501, 2001. © 2001 Wiley-Liss, Inc.

¹Division of Cancer Epidemiology and Genetics, National Cancer Institute, Rockville, Maryland

²University of Washington, Seattle, Washington

³California State University Fresno, Fresno, California

⁴University of Texas School of Public Health, Houston, Texas

⁵Montana State University, Bozeman, Montana

⁶Migrant Clinicians Network, Austin, Texas

⁷Plan de Salud del Valle, Longmont, Colorado

⁸University of Texas School of Nursing, San Antonio, Texas

⁹La Clinica, Wild Rose, Wisconsin

¹⁰SRA Technologies, Inc., Falls Church, Virginia

¹¹Cancer Registry of Central California, Fresno, California

¹²Association of Farmworker Opportunity Programs, Arlington, Virginia

¹³Marshfield Medical Research Foundation, Marshfield (Currently at Centers for Disease Control and Prevention), Wisconsin

¹⁴University of Wisconsin, Madison, Wisconsin

¹⁵Colorado State University, Fort Collins, Colorado

¹⁶Montana Migrant Council, Inc., Billings, Montana

*Correspondence to: Dr. Shelia Hoar Zahm, Deputy Director, Division of Cancer Epidemiology and Genetics, National Cancer Institute, 6120 Executive Boulevard, EPS 8074, Rockville, MD 20892–7242. FAX: (301) 402–3256. E-mail: zahms@mail.nih.gov

KEY WORDS: *farmworkers; agricultural; occupation; questionnaire design; epidemiology; migrant; Hispanic*

INTRODUCTION

Questionnaires are the primary method by which epidemiologists collect information to assess relationships between potential risk factors and disease [Hartge and Cahill, 1998]. Although data on some factors are available from previously collected records, epidemiologists typically have to administer questionnaires in person, by telephone, or by mail to subjects or their proxies. Extensive research has been conducted to develop valid and reliable methods for collecting histories of nutritional, environmental, occupational, medical, and other exposures in epidemiologic studies. Standard techniques, however, often do not work well for subgroups of the population who may differ with respect to culture, literacy, complexity of past exposures, or other characteristics. Specialized instruments and methods of administration may be necessary to collect high-quality data from some population subgroups. A life events calendar method has been used to collect occupational histories from farmers [Hoppin et al., 1998], but modifications are needed to apply this technique to farmworkers.

Migrant farmworkers have a wide variety of occupational and environmental exposures, as well as lifestyle factors, that may put them at increased risk for cancer, birth defects, neurologic diseases, musculoskeletal disorders, infectious diseases, dermatologic conditions, and other diseases [Shaver and Tong, 1991; Meister, 1991]. Little epidemiologic research has been conducted on farmworkers, however [Rust, 1990; Meister, 1991; Zahm and Blair, 1993, Zahm et al., 1997]. It has been thought that locating, interviewing, and collecting reliable data from farmworkers was nearly impossible because of their mobility, complex job histories, lack of self-knowledge of specific occupational or environmental exposures, lower literacy rates, and other factors.

This paper describes the development and pretest of a questionnaire to collect lifetime occupational histories and information on known and suspected risk factors that might be related to cancer among farmworkers. The questionnaire, which included a life events/icon calendar method of collecting work histories, was developed and tested in nine areas of the country to assess the feasibility of conducting epidemiologic studies of cancer among farmworkers, to document the complexity of farmworkers' work histories and other risk factors, and to generate recommendations for future research methods. Other papers in this volume report on comparing the information from this questionnaire with that using traditional methods to collect occupational histories [Engel et al., 2001b], identifying probable pesti-

cide exposures [Ward et al., 2001], and other feasibility issues.

MATERIALS AND METHODS

Questionnaire Development

Through the support of the National Cancer Institute and the Migrant Health Program of the U.S. Bureau of Primary Health Care, a collaborative team, the Farmworker Epidemiology Research Group, was assembled consisting of epidemiologists, occupational health professionals, sociologists, toxicologists, migrant health advocates, and others with experience in conducting research or providing services to farmworkers. The objective of the team was to conduct a series of pilot projects to evaluate several issues critical to epidemiologic studies of farmworkers [Zham et al., 1997]. A critical question was whether farmworkers could provide detailed lifetime occupational histories and information on lifestyle factors potentially related to the development of cancer and other diseases.

Existing questionnaires that had been used by various organizations to collect labor statistics, health utilization data, occupational histories, or disease risk factor information among farmworkers or Hispanics were obtained and evaluated for their suitability in epidemiologic studies. A life events/icon calendar developed by the University of Washington [Engel et al., 2001b] for use in a study of neurologic function was identified as the best available method for collecting occupational histories from farmworkers.

A questionnaire was developed which included a modification of the University of Washington calendar plus items on demographic data, acculturation, occupational history, work practices and living conditions, pesticide exposure, tobacco use, alcohol consumption, medical history, family history of cancer and selected other diseases, and the respondent's assessment of the questionnaire and interview experience. The nonoccupational risk factors were included primarily to simulate the lengthy questionnaire covering a full component of risk factors that are of interest in most epidemiologic studies. The secondary purpose was to determine if any of these factors (e.g., alcohol consumption) had unusual exposure patterns among farmworkers in comparison with the general population. To limit the burden on respondents, we did not include a dietary history because there are well-established questionnaires for collecting dietary data, including questionnaires targeted for Hispanics [Stern et al., 1993; McPherson et al., 1995; Lyons et al.,

1996; Kristal et al., 1997; Pareo-Tubbeh et al., 1999; Stram et al., 2000].

The life events/icon calendar method of collecting occupational histories used a calendar covering the years from the subject's first job to the present (Fig. 1). Each year was divided into months and weeks. Information was entered onto the calendar by a combination of written notations and small pictures, or "icons," of life events, crops, tasks, and protective clothing or equipment. The interviewers had a supply of computer-generated colored pictures on sticky labels to symbolize significant life events, such as country flags and state maps to indicate geographic moves, a bride and groom to symbolize marriage, a red cross to symbolize a major illness or injury, babies for the birth of a child, cars for the purchase of a first automobile, and planes for a first plane ride. The labels were affixed to the calendar at the beginning of the interview and used as chronologic "anchors" around which the subject might more easily recall his or her work history.

Icons of crops, farm tasks (e.g., harvesting/picking, weeding/hoeing, planting, thinning), and common nonfarm jobs (e.g., construction) were also used to record the work history. Three rows were provided to record up to three crop-task combinations per time period. The names of farms, orchards, or ranches and their locations were written on the calendar. The names of crops, farm tasks, and nonfarm jobs for which no icons were available were also written on the calendar. The last two rows of the calendar were used to record protective clothing or equipment and pesticide names. The narrow lines between the rows were filled in with colored markers or pencils to denote the dates and duration of each job (unique crop-task combination) (the color changed at the start of a new job) or periods of unemployment (black color). The colorful icons served as memory aids to help the subjects place the jobs in time and to recall crops and tasks they might have forgotten. The work history was recorded starting with the most recent job and moving backwards in time. If the subject was unable to recall certain periods despite these memory aids and interviewer prompting, these periods were left blank on the calendar. After the rest of the calendar had been filled in, the interviewer and subject together reviewed the missing periods in case the subject's memory had been triggered by the reporting of other jobs.

Work practices, hygiene, and living conditions were assessed by direct questions separately from the calendar. For most variables, the information was collected by one question summarizing past jobs, with possible responses "never, seldom, about one-half the time, most of the time, always," and one question for the current job. For some variables such as type of clothing usually worn while doing farmwork, the subjects were asked what they usually wore (and shown pictures), if there were times when they dressed differently, when were those times, how did they

dress then, and why did they dress differently during those times.

After review by members of the Farmworker Epidemiology Research Group and former farmworkers, the draft questionnaire was revised and translated into Spanish, with back translation into English to assure the quality of the translation. Because the questionnaire was to be used in multiple geographic areas of the U.S., the translation of some sections differed slightly to account for regional language differences. The study protocol was approved by the human subjects committee at the National Cancer Institute and at each participating institution.

Subject Selection and Recruitment

A total of 162 Hispanic farmworkers from nine sites (nine men and nine women from each site) were identified through a variety of mechanisms. The sites included migrant health centers, farmworker community centers, social service agencies, and university research programs located in California (two sites), Colorado, Florida, Montana, Texas, Washington, and Wisconsin (two sites). The subjects were a convenience sample, although the sites in farmworker home-base states (areas where farmworkers maintain permanent homes to which they return during the off-season) were encouraged to identify older persons with longer work histories, who would be in the age range of most subjects in cancer studies. At six sites, all persons approached agreed to participate. At the three remaining sites, ten persons refused because of their work schedules or difficulty in obtaining transportation to the interview location. These subjects were replaced. Subjects were given modest incentives for participating. Subjects were paid \$15–20 at some sites, while other sites distributed gift certificates for local stores, water bottles, coffee mugs, or other items. In general, recruitment and interviews were conducted in Spanish, but English was used if the subject preferred.

Interviews

Interviews took place at the health centers, community centers, social service agencies, or the subject's place of residence. At some sites, the interviewer was accompanied by another person who helped locate the appropriate icons and affix them to the life events/icon calendar.

After the interviews were completed at all sites, we held a meeting with the interviewers and investigators from the nine sites to review the questionnaire, hear their assessment of how successful each component was, and obtain their suggestions for improvement. The questionnaire and a summary of the postinterview assessment are available on request.

Subject Number: **093**
 YEAR: 19**92**

	ENE	FEB	MAR	ABR	MAY	JUN	JUL	AGO	SEP	OCT	NOV	DIC
Life event and location												
Crop/Task or Non-Farm Job	 APPLE PRUNING		 CARPENTER			 CHERRIES PICKING	 HARVESTING	 APPLE		 GRAPES		
Crop/Task or Non-Farm Job						 PEARS PICKING						
Crop/Task or Non-Farm Job												
Crop/Task or Non-Farm Job												
Protective Equipment												
Pesticide												

YEAR: 19**93**

	ENE	FEB	MAR	ABR	MAY	JUN	JUL	AGO	SEP	OCT	NOV	DIC
Life event and location			Sunnyside, WA									
Crop/Task or Non-Farm Job	 APPLE PRUNING		 PLANTING		 GENERAL	 THINNING						
Crop/Task or Non-Farm Job												
Crop/Task or Non-Farm Job												
Protective Equipment												
Pesticide												

FIGURE 1. Two-year sample of life events/icon calendar for collecting occupational histories from farmworkers.
 !, L, I = leather gloves; L = leather boots.

The interview data were coded and computerized by the data coordinating center, SRA Technologies, Inc. Frequencies and cross-tabulations were produced using SAS, version 6 (SAS Institute, Inc., 1989). For every time period of two weeks or longer, up to three jobs (unique crop/task combinations, nonfarm jobs, unemployed, unaccounted), types of protective equipment, and pesticides could be coded, with the starting and stopping dates for the job. Changes in any of the crops or tasks would result in the creation of a new entry with the relevant start and stop dates. Very little information was provided on protective equipment and pesticide use, with no reported changes triggering creation of a new entry. Combining and collapsing the job entries over time to evaluate numbers and duration of jobs was complicated, involving many analysis-specific decisions on how to tally time spent working simultaneously on more than one crop or task. For future use, data editing and analytic strategies might depend on the goals of the investigation and the time windows of etiologic significance to the disease under study.

RESULTS

Interviews were conducted with 81 men and 81 women. The average duration of the interviews was 1 h 34 min (range: 25 min to 3 h 40 min). The work history section took 45 min on average (range: 5 min to 3 h). The interviewers reported that it was necessary to spend additional time in informal conversations before and after the interviews to establish and maintain a good rapport with the subjects. Typically, the longer interviews took place in Texas, California, and Colorado, where a larger number of older subjects were interviewed. The interviews conducted in northern states among young, still migrating, workers tended to be shorter. The subjects reported that reconstructing their life histories was colorful, entertaining, and enjoyable. The life events/icon method made it easier to resume the interview after brief interruptions by young children or other family members in the home during the interview. After examination of the interview data, one male subject was deemed ineligible and eliminated because his agricultural job was as a government inspector with his career spent primarily in one location.

The median age of the subjects in this convenience sample was 40 years overall (range: 16–79 years), 42 years among men (range: 16–79), and 37 years among women (range: 18–76). A total of 113 (71%) were currently married, 13 were divorced (8%), nine were widowed (6%), and 25 (16%) never married. All were Hispanics of Mexican heritage, except for two women from El Salvador and Guatemala, respectively. Approximately two-thirds of the men (66.7%) and one-half of the women (53.8%) had only a sixth grade education or less, most of which occurred outside the U.S.

Occupational History

Summing the time from the first job to the end of the last job, the occupational histories covered 4,376 years for all subjects combined. Sixty-two percent of the time was spent employed in either farm jobs (43%) or nonfarm jobs (18%), 18% comprised periods of unemployment, and 20% was unaccounted time. Men spent a greater proportion of their time working (72%) than women (49%), while the women spent more time unemployed (28%) or unknown (24%) than men (11% and 17%, respectively). Some of the unaccounted time among women was related to pregnancy and child rearing, times when the women were not in the labor force, thus not “unemployed.” Approximately 69% (men: 68%; women: 71%) of the working years was spent in the U.S.

The occupational histories covered a median of 27.6 years per person for men and 20.8 years per person for women (Table I). The median number of years spent in farm jobs was 11.3 (range: 1.0–58.2) for men and 5.8 (range: 0.2–41.1) for women.

The median number of farm jobs (crop/task combinations) per person was 59 (range: 1–370) among men (Table II). Women reported fewer farm jobs, with a median of 27 jobs per person (range: 1–334). The farmworkers performed many of the same crop/task combinations repeatedly throughout their lives, yielding a median of 13 unique farm jobs (range 1–41) among men and 7 (range: 1–34) among women. The median number of unique crops was 8 (range: 1–22) among men and 5 (range: 1–20) among women.

Table III presents the top 15 crops by the number of people reporting, with the number of months reported, by sex. Sweet corn, grapes, onions, tomatoes, cucumbers, oranges, cotton, apples, cantaloupe, sugar beets, green peppers, potatoes, and asparagus were reported frequently by men and women, whereas beans and peaches were common among men only and strawberries, carrots, cherries, and Christmas trees were common among women only in this convenience sample of farmworkers. Forty-four subjects (35 men, 9 women) reported having worked with cattle or other livestock, covering 1,700 months of work history for all subjects combined (men: 1551; women: 149).

The most common farm tasks reported are presented in Table IV by number of people, by sex, with the number of months. Harvesting/picking was by far the most common task among the men and women in this convenience sample. Other frequently performed tasks were weeding/hoeing, planting, pruning, thinning, packing, sorting, plowing, driving farm equipment, factory (produce processing), and transporting tasks. Irrigation work, spraying pesticides, cleaning and maintaining farm equipment, and haying were less common and primarily performed by men, whereas tying vines, plant nursery work, fencing, fertilizing, and

TABLE I. Duration of Farmworker Occupational Histories per Person for Farm Jobs (Crop/Task Combinations), Non-farm Jobs, Unemployment, and Unaccounted Time, by Sex

	All farmworkers	Men	Women
Total occupational history	n = 161	n = 80	n = 81
Median years per person	24.8	27.6	20.8
Range	3.4–68.7	5.3–68.7	3.4–56.7
All jobs	n = 161	n = 80	n = 81
Median years per person	12.1	17.8	9.0
Range	0.4–59.8	1.0–59.8	0.4–41.1
Farm jobs (crop/task combinations)	n = 161	n = 80	n = 81
Median years per person	8.2	11.3	5.8
Range	0.2–58.2	1.0–58.2	0.2–41.1
Nonfarm jobs	n = 111	n = 57	n = 54
Median years per person	3.1	3.4	2.9
Range	0.1–45.7	0.1–45.7	0.1–32.5
Unemployed	n = 106	n = 47	n = 59
Median years per person	4.4	2.8	4.9
Range	0.2–47.6	0.2–25.7	0.2–47.6
Unaccounted	n = 144	n = 72	n = 72
Median	2.8	2.8	2.7
Range	0.1–53.1	0.1–53.1	0.1–39.8

TABLE II. Number of Total Jobs, Farm Jobs (Crop/Task Combinations), and Nonfarm Jobs Plus Number of Unique Farm Jobs and Crops per Person, by Sex

	All farmworkers	Men	Women
All jobs	n = 161	n = 80	n = 81
Median number per person	48	66	30
Range	2–382	3–382	2–334
Farm jobs (crop/task combinations)	n = 161	n = 80	n = 81
Median number per person	42	59	27
Range	1–370	1–370	1–334
Unique farm jobs	n = 161	n = 80	n = 81
Median number per person	10	13	7
Range	1–41	1–41	1–34
Unique crops	n = 161	n = 80	n = 81
Median number per person	6	8	5
Range	1–22	1–22	1–20
Nonfarm jobs	n = 111	n = 57	n = 54
Median number per person	4	5	3
Range	1–62	1–62	1–20

TABLE III. Top 15 Crops by Number of Farmworkers, With Number of Months Worked, by Sex*

Crop	All farmworkers			Men			Women		
	No. of people	No. of months	Crop	No. of people	No. of months	Crop	No. of people	No. of months	Crop
Corn (sweet)	78	3447	Corn (sweet)	54	2678	Grapes	27	1205	
Grapes	57	2355	Grapes	30	1150	Onions	27	539	
Onions	55	1366	Onions	28	827	Cucumbers	25	310	
Tomatoes	49	1253	Oranges	26	1227	Corn (sweet)	24	769	
Cucumbers	48	620	Tomatoes	25	432	Tomatoes	24	821	
Oranges	43	1737	Apples	23	572	Oranges	17	510	
Cotton	39	2255	Cotton	23	1445	Peppers (green)	17	283	
Apples	38	732	Cucumbers	23	310	Cantaloupe	16	596	
Cantaloupe	37	1211	Cantaloupe	21	615	Cotton	16	810	
Beets (sugar)	34	1513	Beans	21	924	Potatoes	16	200	
Pepper (green)	34	831	Asparagus	19	356	Apples	15	160	
Potatoes	33	496	Beets (sugar)	19	891	Beets (sugar)	15	622	
Asparagus	29	728	Peaches	18	358	Strawberries	15	213	
Beans	29	1253	Peppers (green)	17	548	Carrots	11	207	
Peaches	27	614	Potatoes	17	296	Asparagus	10	372	
						Cherries	10	73	
						Christmas trees	10	95	

*A total of 76 farmworkers (51 men, 25 women) reported one or more farm jobs with an unknown crop, accounting for 3,280 months (men: 2,770 months; women: 510 months).

TABLE IV. Top 15 Farm Tasks by Number of Farmworkers, With Number of Months Worked, by Sex*

Task	Men			Women		
	No. of people	No. of months	Task	No. of people	No. of months	Task
Harvesting/picking	135	9348	Harvesting/picking	72	5992	Harvesting/picking
Weeding/hoeing	75	2025	Planting	44	1288	Weeding/hoeing
Planting	73	1875	Pruning	38	1061	Planting
Pruning	57	1262	Weeding/hoeing	37	975	Thinning
Thinning	52	1209	Thinning	29	590	Sorting
Packing	33	648	Plowing	18	625	Pruning
Sorting	27	439	Packing	16	254	Packing
Plowing	21	793	Driving farm equipmnt	16	988	Produce factory processing
Driving farm equipment	19	1027	Irrigation	8	873	Tying vines
Produce factory processing	12	125	Produce factory processing	7	98	Plowing
Irrigation	8	873	Pesticide spraying	7	91	Nursery (plants)
Transporting	8	216	Transporting	7	211	Driving farm equipment
Pesticide spraying	7	91	Sorting	6	111	Transporting
Tying vines	7	74	Cleaning/ Maintaining equipment	5	121	Fencing
Nursery (plants)	6	54	Haying	5	143	Burning
						Fertilizing

*A total of 80 farmworkers (47 men, 33 women) reported one or more farm jobs with an unknown task, accounting for 3,023 months (men: 1,937 months; women: 1,089 months). "Other farm work" was reported by 54 farmworkers (29 men, 25 women), accounting for 1,721 months (men: 1,063; women: 658 months). "General farm work" was reported by 52 farmworkers (33 men, 19 women), accounting for 1,033 months (men: 884; women: 149 months).

burning were among the top 15 tasks performed primarily by women. Although only seven men reported spraying pesticides as a task in their work history, more subjects reported use in response to a direct question concerning ever having applied pesticides during their work with crops (26 farmworkers, 18%; 23 men, 30%; 3 women, 4%). Approximately one-half (48%) of the farmworkers reported working in a field while someone was spraying it with pesticides or soon after someone had applied pesticides. One-third reported having had symptoms or health problems that they attributed to pesticides.

Table V presents data related to working conditions and hygiene measures that might affect farmworkers' potential exposure to pesticides, fertilizers, and other substances. With respect to past jobs, 72% reported having clean drinking water available in the field at least half the time. Fourteen percent reported having to draw water to drink from a ditch or irrigation canal half the time or more while working in the field. Twenty-three percent used water from a ditch or canal to wash their hands half the time or more. Approximately three-quarters reported washing their hands before eating, drinking, or chewing gum at least half the time in the past, whereas less than half reported washing before urinating. In the past, 32% of the farmworkers typically ate unwashed food from the fields while working. Twenty-six percent of the farmworkers (35% men; 18% women) usually wore the same work clothes for more than one day before laundering.

Life Style Factors

Data collected included tobacco use and alcohol consumption. Fifty-five percent of male farmworkers reported having smoked at least 100 cigarettes, with 26% current smokers. Sixteen percent of the women reported ever smoking, with 10% current smokers. Twenty-one percent of the men who smoked started before age 13, whereas all of the women started at age 13 or older. Sixty-two percent of the female smokers, but only 11% of the male smokers, began after age 18. The alcohol consumption varied between weekday and weekends, with more common and heavier consumption on weekends. Approximately 19% of men and 3% of women reported drinking alcohol on the weekdays. The prevalence of consumption more than doubled on the weekends to 44% among men and 10% among women. More than five drinks per weekend was reported by 20% of the men, but no women. The form of alcohol consumed was exclusively beer, except for two women who reported drinking hard liquor on weekends. Men typically drank greater quantities of alcohol than women.

Information on reproductive history and cancer screening practices showed the average age at first pregnancy was 19, the average number of pregnancies was five (range: 0–19), and the average number of children was five (range: 0–19). Eighty-nine percent of the women reported ever having had a Papanicolaou smear. Thirty-eight percent of all

TABLE V. Working Conditions and Hygiene Measures Among Farmworkers in Their Past Jobs and in Their Present Jobs

	No.	Past jobs ^a	No.	Present job
Water in the fields				
Clean water available for drinking	160	115 (71.9%)	123	120 (97.6%)
Had to draw water from ditch/irrigation canal to drink	161	22 (13.7%)	121	5 (4.1%)
Had to draw water from ditch/irrigation canal to wash hands	161	37 (23.0%)	122	14 (11.5%)
Toilet available in or near fields that could be used easily	159	85 (53.5%)	123	114 (92.7%)
Hand washing				
Washed hands before eating, drinking, or chewing gum	159	122 (76.7%)	122	105 (86.1%)
Washed hands before urinating/going to the bathroom	160	76 (47.5%)	118	75 (63.6%)
Washed hands before smoking or using chewing tobacco	109	10 (9.2%)	83	12 (14.5%)
Washed hands before entering living quarters	156	61 (39.1%)	116	60 (51.%)
Ate foods from fields				
Ate foods from the fields while working	159	64 (40.3%)	121	66 (54.5%)
Ate foods from the fields without washing it	161	51 (31.6%)	120	43 (35.8%)
Number of days usually wore the same work clothes before washing them				
		All	Men	Women
1		117 (73.6%)	52 (65.0%)	65 (82.3%)
2		28 (17.6%)	18 (22.5%)	10 (12.7%)
3		11 (6.9%)	8 (10.0%)	3 (3.8%)
> 3		3 (1.9%)	2 (2.5%)	1 (1.3%)

^a Responded "always," "most of the time", or "about half the time."

farmworker women and 68% of farmworker women over age 49 years reported ever having had a mammogram.

DISCUSSION

Farmworkers' occupational histories are complex, with many jobs and location changes, sometimes up to hundreds of jobs over a lifetime. Accurate recall of these histories is difficult. Some farmworkers repeat the same set of jobs and migration patterns year after year, making their histories easier to report, but, overall, reporting is challenging. Traditional epidemiologic methods of obtaining an occupational history (i.e., asking for the first job/task, the next job/task, and repeating for the life span) are tedious and quickly lose the interest and participation of farmworker subjects [Engel et al, 2001b].

This paper describes a pilot project to develop and test a questionnaire designed to elicit a long, detailed occupational history by recording life events on a calendar and placing small pictures on the calendar to mark life events, crops, farm tasks, and nonfarm jobs. Although on average the questionnaire took over 1 h 30 min to complete, with some subjects taking much longer, it was received favorably by the farmworkers. The life events/icon method is well suited for persons with long occupational histories, particularly if they are semiliterate or illiterate.

There was variability in the work histories across the subjects in this study. The farmworkers differed from each other in the crops and tasks they performed over their lifetimes. We were able to capture these differences with the questionnaire, suggesting that it may be possible to identify subgroups of farmworkers with different exposures and different subsequent risk for disease. Our data indicate that epidemiologic analyses need not be limited to the job title "farmworker," which would introduce misclassification of exposure [Hoar et al., 1980], but can be based on specific crops, tasks, or even pesticides, as demonstrated by Ward et al. (2001). Our results also provide guidance for future studies on the number of jobs, crops, and tasks per person that may be reported by farmworker populations. These data can help investigators anticipate the type and number of crop and task labels needed, the questionnaire length, and other questionnaire features they will need to incorporate in their studies.

We had no official preexisting work records with which to compare the reported work histories, so we could not rigorously assess the validity of the self-reported histories [Engel et al., 2001a]. There were several indications that the information was of reasonable quality, however. Jobs and tasks were described for 80% of the time period covered by the occupational histories, which was much more time than for histories collected with traditional methods [Engel et al., 2001b]. Some of the data were similar to those collected from farmworkers in other surveys, although other surveys

generally did not attempt to collect detailed lifetime histories [Mentzer and Villalba, 1988; Mines et al., 1991; Suarez, 1994; Zambrana et al., 1999]. For example, the most common crops and tasks in the convenience sample in our study were similar to those reported in the 1990 National Agricultural Workers Survey (NAWS) [Mines et al., 1991]. The NAWS collected information on the number of years in farmwork and detailed information on crops and tasks for the past year only. The proportion of time farmworkers spent in nonfarm jobs and the types of nonfarm jobs held were similar in our project and in NAWS. In our survey, the median number of years of farmwork was 11.3 years among the men and 5.8 years among the women. The NAWS, which was comprised of 71% men, reported an average of 10.1 years spent in farmwork [Mines et al., 1991]. The proportion of farmworkers in this project who reported working in a field while, or soon after, someone was spraying pesticides (48%) was similar to the proportion of Washington State farmworkers reported to have worked in a field within two days of its being treated with pesticides (47%) and to the proportion exposed from spraying accidents or drift (43%) [Mentzer and Villalba, 1988]. A survey in Arizona observed 43% of vegetable farmworkers and 51% of fruit farmworkers had been exposed to pesticides [Meister et al., 1988]. In the current survey, about one-third claimed they had symptoms or health problems related to pesticide exposure. In Arizona, 29% of the farmworkers had skin problems and 17% had respiratory problems which they attributed to pesticides [Meister et al., 1988].

In 1978, 44.1% of Wisconsin farmworkers reported having a toilet available in the field. The proportion with access to a toilet increased to 93.1% by 1989 [Slesinger and Ofstead, 1993]. The 1990 NAWS reported that 88% had access to a toilet [Mines et al., 1991]. In our project, 53.5% of the farmworkers reported having a toilet available at jobs in the past. In present jobs, 92.7% of the farmworkers reported having a toilet available. The 1989 survey of Wisconsin field farmworkers also reported that 37.9% had no place to wash their hands in the fields. The 1990 NAWS reported that 24% of farmworkers had no access to water for washing at work [Mines et al., 1991]. In our survey, 23% of the farmworkers reported having to draw water from ditches or irrigation canals to wash their hands in the fields half the time or more in their past jobs.

The prevalence of lifestyle factors reported by the farmworkers in this project are similar to those reported in other surveys of farmworkers and other Hispanics. In this study, 26.3% of the men and 10.0% of the women reported being current smokers. A 1989 study of Latinos in San Francisco reported 26% of the men and 8% of the women were current smokers [Perez-Stable et al., 1994]. The Hispanic Health and Nutrition Examination Survey reported higher prevalence of current smokers among Mexican

American men (44%) and women (24%) [Marks et al., 1990] than among the farmworkers. Alcohol consumption on weekends was reported by 43.8% of the men and 10.0% of the women farmworkers, with more than five drinks per weekend reported by 20% of the men, but no women. "Binge drinking," defined as drinking more than five drinks on one occasion in the previous month, was reported by 33% of Latino men and 11% of Latina women in the San Francisco survey [Perez-Stable et al., 1994].

The history of a Pap smear was higher than that reported for Mexican-Americans and Mexican women in America in other surveys, perhaps because of the young age and frequent childbearing experience of the farmworker women, which leads to encounters with the medical care system and a higher likelihood of having a Pap smear [Solis et al., 1990; Elder et al., 1991; Suarez, 1994; Perez-Stable et al., 1994; Zambrana et al., 1999]. Similarly, the young age of the women may explain the lower prevalence of mammograms overall in comparison to other studies of Mexican-American women, particularly more acculturated women [Solis et al., 1990; Elder et al., 1991; Perez-Stable et al., 1994; Zambrana et al., 1999]. The prevalence of mammogram among farmworker women aged 50 years or older (68%) is lower than that reported in some surveys of other Hispanic women [Perez-Stable et al., 1994], but not all [Elder et al., 1991; Suarez, 1994; Zambrana et al., 1999].

Recommendations

This pilot project revealed many aspects of the questionnaire, interview experience, and coding that could be improved for use in a full-scale epidemiologic study. For example, there was general agreement that the calendar should be larger with rows labeled on the side, not labeled by letters strung across the boxes. The calendar's smallest unit of time, a week, could probably be increased to two weeks with little loss of information. For older subjects, whose memory of distant events is of uncertain accuracy, perhaps even longer blocks of time (e.g., months, seasons) for early periods of their lives would be adequate. Long job histories (e.g., 25 charts) were challenging to handle and display simultaneously on the poster board. The icons, which had to be peeled off a page and cut in half for use, would be faster to use if printed individually or produced like rolls of stamps. Some of the icons need to be changed and some new ones created. For example, the Statue of Liberty, denoting the first entry to the U.S., had little meaning to farmworkers and was replaced by a U.S. flag. Icons of various state maps were all one color, and should be made of different colors. The bandana protective clothing icon was not depicted the way bandanas were usually worn by farmworkers, but appeared like an "outlaw" to the subjects. Icons would be useful for additional crops (e.g., strawberries), tasks (e.g., tying vines), and significant

life events (e.g., First Communion and quinceanera celebrations for girls' 15th birthday).

The interviewers also recommended wording changes to improve the translation or the subjects' understanding of the intent of questions. More standardized rules for recording and coding multiple simultaneous tasks and patterns that repeat in multiple years need to be developed. The complex job histories pose data processing and analysis difficulties that can be solved with information gained in this pilot.

CONCLUSIONS

This project pilot-tested a questionnaire that collected lifetime occupational histories and information on other known and suspected risk factors that might be related to cancer among farmworkers. The project demonstrated that it is feasible to collect detailed histories and other risk factor data from farmworkers, documented the complexity of work histories encountered among farmworkers, and yielded recommendations for refining the questionnaire, as well as interesting data on demographic characteristics, occupational histories, work practices, hygiene, and lifestyle factors, that will facilitate epidemiologic research on farmworkers.

ACKNOWLEDGMENTS

The authors would like to acknowledge the invaluable support of Mr. Jack Egan, U.S. Bureau of Migrant Health, Ms. Karen Mountain, Migrant Clinicians Network, and Ms. Roberta Ryder, National Center for Farmworker Health.

REFERENCES

- Elder JP, Castro FG, de Moor C, Mayer J, Candelaria JI, Campbell N, Talavera G, Ware LM. 1991. Differences in cancer-risk-related behaviors in Latino and Anglo adults. *Prev Med* 20:751-763.
- Engel LS, Keifer MC, Thompson ML, Zahm SH. 2001a. Test-retest reliability of an icon/calendar-based questionnaire used to assess occupational history. *Am J Ind Med* 40:512-522 (this issue).
- Engel LS, Keifer MC, Zahm SH. 2001b. A comparison of a traditional questionnaire with an icon/calendar-based questionnaire to assess occupational history. *Am J Ind Med* 40:502-511 (this issue).
- Hartge P, Cahill J. 1998. Field methods in epidemiology. In: Rothman KJ, Greenland S, Editors. *Modern epidemiology*. 2nd ed. Philadelphia: Lippincott-Raven Publishers, p. 163-180.
- Hoar SK, Morrison AS, Cole P, Silverman DT. 1980. An occupation and exposure linkage system for the study of occupational carcinogenesis. *J Occup Med* 22:722-726.
- Hoppin JA, Tolbert PE, Flagg EW, Blair A, Zahm SH. 1998. Use of a life events calendar approach to elicit occupational history from farmers. *Am J Ind Med* 34:470-476.
- Kristal AR, Feng Z, Coates RJ, Oberman A, George A, George V. 1997. Associations of race/ethnicity, education, and dietary intervention with the validity and reliability of a food frequency questionnaire:

- The Women's Health Trial Feasibility Study in Minority Populations. *Am J Epidemiol* 146:856-869.
- Lyons GK, Woodruff SI, Candelaria JI, Rupp JW, Elder JP. 1996. Development of a protocol to assess dietary intake among Hispanics who have low literary skills in English. *J Am Diet Assoc* 96:1276-1279.
- Marks G, Garcia M, Solis JM. 1990. III. Health risk behaviors of Hispanics in the United States: Findings from HHANES, 1982-84. *Am J Public Health* 80(Suppl):20-26.
- McPherson RS, Kohl HW, Garcia G, Nichaman MZ, Hanis CL. 1995. Food-frequency questionnaire validation among Mexican-Americans: Starr County, Texas. *Ann Epidemiol* 5:378-385.
- Meister JS. 1991. The health of migrant farm workers. *Occup Med State Art Rev* 6:503-518.
- Meister JS, deZapien J, LaBrec PA. 1988. The Arizona farmworker health history and data base: Working paper No. 2. Tucson, AZ: Southwest Border Rural Health Research Center, University of Arizona.
- Mentzer M, Villalba B. 1988. Pesticide exposure and health: a study of Washington Farmworkers. Granger, WA: Evergreen Legal Services, Farm Worker Division.
- Mines R, Gabbard S, Boccalandro B. 1991. Findings from the National Agricultural Workers survey (NAWS) 1990: A Demographic and Employment Profile of Perishable Crop Farm Workers. U.S. Department of Labor, Office of Program Economics Research Report No. 1. Washington DC: United States Government Printing Office.
- Pareo-Tubbeh SL, Romero LJ, Baumgartner RN, Garry PJ, Lindeman RD, Koeller KM. 1999. Comparison of energy and nutrient sources of elderly Hispanics and non-Hispanic whites in New Mexico. *J Am Diet Assoc* 99:572-582.
- Perez-Stable EJ, Marin G, Marin BVO. 1994. Behavioral risk factors: a comparison of Latinos and non-Latino Whites in San Francisco. *Am J Public Health* 84:971-976.
- Rust GS. 1990. Health status of migrant farmworkers: a literature review and commentary. *Am J Public Health* 80:1213-1217.
- SAS Institute, Inc. 1989. SAS/STAT User's Guide, Version 6, Fourth Edition, Volume 1. Cary, NC: SAS Institute, Inc.
- Shaver CS, Tong T. 1991. Chemical hazards to agricultural workers. *Occup Med State Art Rev* 6:391-413.
- Slesinger DP, Ofstead C. 1993. Economic and health needs of Wisconsin migrant farmworkers. *J Rural Health* 9:138-148.
- Solis JM, Marks G, Garcia M, Shelton D. 1990. II. Acculturation, access to care, and use of preventive services by Hispanics: findings from HHANES 1982-84. *Am J Public Health* 80 (Suppl):11-19.
- Stern MP, Gonzalez C, Hernandez M, Knapp JA, Hazuda HP, Villapando E, Valdez RA, Haffner SM, Mitchell BD. 1993. Performance of semiquantitative food frequency questionnaires in international comparisons: Mexico City versus San Antonio, Texas. *Ann Epidemiol* 3:300-307.
- Stram DO, Hankin JH, Wilkins LR, Pike MC, Monroe ICR, Park S, Henderson BE, Nomura AM, Earle ME, Nagamine FS, Kolonel LN. 2000. Calibration of the dietary questionnaire for a multiethnic cohort in Hawaii and Los Angeles. *Am J Epidemiol* 151:358-370.
- Suarez L. 1994. Pap smear and mammogram screening in Mexican-American women: the effects of acculturation. *Am J Public Health* 84:742-746.
- Ward MH, Prince JR, Stewart PA, Zahm SH. 2001. Determining the probability of pesticide exposures among migrant farm workers: results from a feasibility study. *Am J Ind Med* 40:538-553 (this issue).
- Zahm SH, Blair A. 1993. Cancer among migrant and seasonal farmworkers: an epidemiologic review and research agenda. *Am J Ind Med* 24:753-766.
- Zahm SH, Blair A, The Farmworker Epidemiology Research Group. 1997. Brief Communication: Cancer feasibility studies among migrant farmworkers. *Am J Ind Med* 32:301-302.
- Zambrana RE, Breen N, Fox SA, Gutierrez-Mohamed ML. 1999. Use of cancer screening practices by Hispanic women: analyses by subgroup. *Prev Med* 29:466-477.