A COHORT-CENTRIC ANALYSIS OF OUTDOOR RECREATION PARTICIPATION CHANGES

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Abstract. -- Traditional modeling of outdoor recreation participation has used cross-sectional data and has attributed the lower participation rates among older persons to aging. These lowered rates may also reflect cohort differences. To the extent that differences in participation rates are due to cohort effects, the present participation patterns of age cohorts will be carried forward as the cohorts age. This paper tracks the outdoor recreation patterns of several cohorts for 5 selected activities through 3 national recreation surveys in the last 22 years. Conclusions are drawn about the usefulness of cohort as an explanatory variable in predicting future outdoor recreation participation.

Cross-sectional data describing recreation participation in the United States typically have shown less participation among older individuals (e.g. Mueller and Gurin, 1962, and Robinson, 1979). In models based upon these cross-sectioned data, the lowered participation rates are usually attributed to aging. This implies that those who are young and active now will become less active in the future in a pattern resembling that of the current older adults. Trend data presented in this paper, and drawn from the National Recreation Surveys (1960, 1965, 1972, 1977 and 1982) show both that older segments of the population are more active now than in past periods and that participation in selected activities has increased for many groups of people as they have aged. If such differences in participation levels exist among persons of the same age at different periods of time, then aging alone does not fully explain these changes in participation.

Rentz, Reynolds, and Stout (1983) have shown that analysis based upon one set of cross-sectioned data may lead to erroneous conclusions. Similarly, models that predict changes in recreation participation through time should be based upon examination of the effects of both aging and age cohorts. An age cohort is comprised of a group of individuals who were born during the same time period and therefore who were subject to the same world events and social forces at the same points in their lives. People born at different times often experience

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different circumstances such as social values, fads, and new recreation opportunities. Thus different cohorts may exhibit different behavioral and attitudinal patterns that are carried through life and can influence recreation styles (Riley 1971, Chubb and Chubb 1981). Using both aging and cohort factors in models to explain observed differences in recreational behaviors may offer important improvements in our ability to predict future participation levels and patterns.

> "To the extent that these differences (in outdoor recreation participation levels) are age effects, the leisure activities of present young adults should come to resemble those of older adults as the former grow older. But to the extent that the differences are cohort effects, the leisure activities of present young adults are likely to provide the best available basis for predicting what their leisure activities will be when they are older. Judgements on such matters can be of value to governmental agencies...in planning for the recreational needs of the population in the years ahead, and they can help businesspersons and investors assess the probable future demand for certain kinds of goods and services." (Glenn 1981).

This paper examines the relative importance of age period and cohort effects in explaining changes in recreation participation using data from previous National Recreation Surveys.

METHODS

We examined data from 3 of the previous 5 National Recreation Surveys --- 1960, 1972, and 1982. Each survey was an approximate probability sample of persons in the United States aged 12 years and older. We examined the percentage of each of 7 age groups and 6 age cohorts that participated in the last 12 months in each of 5 selected activities (fishing, hunting, downhill skiing, hiking and/or backpacking, and developed site camping), and compared the percentages across the 3 national surveys.

Age groups were defined in 10-year intervals to correspond as closely as possible to the intervals between the surveys. The youngest age group included persons aged 12-21 inclusive; the next group aged 22-31, and so on.

Cohort analysis attempts to separate the effects of aging, cohort membership and 'period'. Period influences are external influences that affect all ages and cohorts. No single set of statistical techniques are agreed upon as perfectly suited to cohort analyses (Glenn 1977; Rentz et al. 1983). Cohort analysis is made more difficult by the linear interdependency of the operational measurement of the 3 effects. Cohort membership can always be determined by subtracting age from period (measured by year of observation). The most commonly used procedure for surveys of unequal intervening time intervals entails the construction of 2 "cohort" tables. The first table consists of columns of cross-sectional data divided by age intervals and allows comparison of

age groups over time. The second table tracks each cohort across time and allows examination of the effects of aging and period influences on the cohorts. Glenn (1977) posits that visual inspection of these tables can be used to determine which of the effects are present in the data. Mason, Mason, Winsborough and Poole (1973) and Rentz, et.al. (1983) advocate the use of a constrained multiple regression model, coding age group, cohort and period as a series of dummy variables. However, Glenn (1977) has criticized this method for the assumptions necessary to allow the model to function. For the purpose of this analysis, we will use the cohort table procedures.

Variation within the cohort tables can be attributed to 3 sources: age, cohort and period influences. Cohort tables help to identify which of these sources is at work. If only age effects are present, then all variation will be between the rows of the cross-sectional table. If only period influences are present, all variation will be between the columns of the cross-sectional table. If only cohort effects are present, all variation will be between cohorts in the second table. Cohort tables with multidimensional variation patterns indicate that more than one of the 'pure' effects is present. The researcher must then explain the variation pattern in terms of several of the effects working in concert. Often, information external to the data in the table can help the researcher decide upon the combination of effects that are present, and what influence each effect exerts. Glenn (1977) indicated that this 'side information' is often critical to proper interpretation of cohort tables.

RESULTS

Participation percentages for almost all age groups for all activities except hunting have increased across the 3 surveys (Tables 1-5). While hunting participation peaked in 1972 for 5 of the age groups, there was still an overall increase for each age groups for the 22-year period from 1960 to 1982 (Table 5). These results confirm that for many outdoor recreation activities participation across all age groups is generally on the rise.

Especially for the more physically demanding activities, hiking and skiing, participation by the 2 oldest age groups remained at near zero (Tables 1 and 4), even though the participation among persons under 60 has increased dramatically for these 2 activities since 1960.

A clearer picture of the age, period and cohort effects are gained by teaching cohorts over time, and the patterns of participation are somewhat surprising. For hiking, participation within cohorts has increased over the last 22 years except for the oldest 2 cohorts (Table 9). For skiing, participation by younger cohorts has increased, while decreasing for older cohorts (Table 6). Cohort 4, those who were in their mid- and late- thirties in 1960, first showed a rise in participation (1960-1972), and then an almost equal drop from 1972-1982. Cohort participation in the more sedentary activities (e.g., hunting, fishing, and camping) peaked in 1972 for at least 4 of the 6 cohorts for

which there are 3 data points (Tables 7, 8, and 10). For all activities except hunting, participation by cohort 1 increased from 1972-1982. For all activities, the younger cohorts are more active than the older ones, at each point in time. Each cohort is also more active than was the next older cohort at the same age. These results indicate that cohort effects are present.

DISCUSSION

Aging alone does not adequately explain the changes in outdoor recreation participation in these activities over time. For all activities and most cohorts, there was a general rise in percentage of respondents participating from 1960 to 1982, so that if there were no period effect, aging of the cohort would have to be the cause of this rise in participation for each cohort.

For camping, fishing, and hunting (Figures 1-3) the jump in participation for all but the oldest cohort shows the positive period influence at work. This influence is very likely the Land and Water Conservation Fund money spent on the development of camping facilities, boat ramps, fishing access points and piers, land acquisition, etc. This served to dramatically increase the available supply of recreation facilities and resources. The post-1972 jump in hiking participation reflects the boom in hiking popularity in the 70's that can be attributed in part to technological changes in hiking and backpacking equipment, and to trail development. The marked decline in hunting defined as non big-game hunting for all cohorts except one may have been caused by either a decline in peoples' interest in the sport due to changing social values, to a reduction in available places to hunt due to increased urbanization and sprawl, or both. These data also seem to support the observations of Cordell and Cordell (1984) and others that there is a growing interest in (i.e., period influence toward) physically demanding outdoor recreation activities, and away from sedentary activities in the last 10 years. The declines, or at best very slow growth, in participation by most cohorts in sedentary activities from 1972-1982, and decline in hunting by the youngest cohort, may also indicate that there may be a period influence away from these types of activities. This seems likely, due to the increased interest in fitness mentioned above, and since the same cohorts are increasing participation in more demanding activities while decreasing it in less demanding ones. Age-induced decline would predict that cohorts would stop participating in more demanding activities first.

An age effect is also evident, and supports theories that aging does lead to a decline in participation. Undoubtedly, aging accounts for at least some of the lower participation rates of the older cohorts. An age effect is also evident in that older cohorts responded less to the period influences. There seems to be an age-induced drop in participation that begins to outpace the period influences. Aging may also cause the person to become less willing to change his recreational patterns, a phenomenon gerontologists have termed "rigidity". While the direction of participation changes for the youngest 4 cohorts is nearly identical, the magnitudes of the changes vary systematically. The 2

youngest cohorts are more actively inclined (the increases in participation are larger and the declines smaller) than the older 2 of these cohorts. It appears possible that age may have a hyperbolic effect on participation rates, first causing an increase in participation as the individual moves from adolescence into young adulthood and acquires new experience and knowledge, increased freedom (car) and ability to participate (income from job). Younger people may also be more likely to respond to fads and social changes, causing bigger swings in their participation rates. Leveling of participation rates seems to occur as the individual reaches middle age. The pressures and time committments to home, family, social groups and clubs as well as settling into a few favorite activities may keep these people from trying new activities and thus increasing participation rates. Old age then has a reducing effect on participation.

A cohort effect is also obvious from the graphs. Each succeeding (younger) cohort participates at a consistently higher level than the next older one. The patterns of participation changes are similar for all cohorts, but the most apparent difference between cohorts is the level of participation. This is the clearest evidence possible of a cohort effect (Rentz et.al. 1983). The forces that caused the positive period shift in participation (increased supply and increased interest in outdoor recreation activities/fitness) also account for some of the differences between cohorts. Most recreation takes place close to home (Cordell and English 1984), so that the increased supply makes participation by younger cohorts more likely since they grew up with a ready supply of facilities at hand. Outdoor recreation is a social experience (Bammel and Bammel 1981), so that the increased societal interest is transferred to values held by the cohort. Some research has found that participation in activities early in life correlates positively with later participation (Chubb and Chubb 1981).

Cohorts that participated more in outdoor recreation activities in the early and middle portions of their lives are continuing in those patterns for the 22 years covered by these data. These differences in the behavior patterns of cohorts that are due to early indoctrination to the activities constitute a cohort effect, and these differences are likely to continue into the future.

While the influences of age, period and cohort are all visible, it is not easy to determine the relative magnitude of their effects, nor precisely how they interact. However, several things are clear. First, that the decline in participation observed in any one cross-sectional study is not solely due to aging; cohort differences are also reflected in such data.

Second, past and present participation patterns across age groups will not hold true for the future. One may expect that the mix of activities participated in is likely to continue to shift toward more demanding activities. Also, the mix of participants in all activities is likely to shift, with a more active elderly population, as aging cohorts continue to participate in activity patterns with which they grew up.

One caveat is important. The measure of participation used (percent of the age group or cohort participating in the activity in the previous 12 months) may not have been the most appropriate measure. Percent participating does not measure the avidity of the respondent, i.e., number of times participated. Nor does percent participating measure possible change in the participation within an activity, i.e., specialization in equipment, location. or time.

RESEARCH IMPLICATIONS

Cohort analysis appears to have wide application for examining outdoor recreation behavior. The current technology to study the combination of effects in cohort analysis, however, does not enable clear distinction between age, period and cohort effects, nor any examination of their interactions. Work is needed to develop standard statistical analyses for stating the relative importance of each effect and the probability that observed effects may be chance occurrences. This paper also indicates that the effect of age is different than typically thought, based on any simple cross-sectional data, and that cohort membership may be an important concept for recreation participation modeling. Improvement of cohort analysis is needed to allow researchers to partial out the aging and age-cohort effects that account for the lower participation by older cohorts, and the combined cohort-period effects that have led to increased participation in each age group.

Further research is needed to more closely examine the strength of the observed shift toward more active forms of recreation. It is not precisely clear exactly how age, cohort and period have interacted to produce these results. Research is also needed to identify how to specify variables or measures of cohort effects in participation modeling. Since cohort effects represent influences on future patterns or trends in future participation, measurement of these effects should provide a basis for better models and therefore better forecasts of future participation.

MANAGEMENT IMPLICATIONS

Based on the above analyses, managers cannot expect future recreation participants to be of the same age mixtures as exist currently. If the changes between 1960 and 1982 are any indication of the future, the mix of activities will likely shift, with more growth in the more physically demanding activities, and many more participants in the post- and near-retirement age groups.

Close watch needs to be kept on the baby-boom cohort, persons born from 1946-1961, and their participation patterns, as they complete their move into the workforce. Their numbers and massive buying power will shape the recreation products and services market for at least the next 20-30 years, and hence will be a major determinant of the demands put on recreation facilities and resources.

Understanding the effects of age cohorts on recreation participation also has important implications for public agency planning. Comprehensive planning often involves forecasting future recreation demand and participation. Tracking age cohorts will greatly enhance our understanding of the likely direction of future participation patterns.

LITERATURE CITED

Bammel, G. and Burrus-Bammel, L. L. 1982. Leisure and Human Behavior. Dubuque, IA: William C. Brown Company Publications.

Chubb, M. and Chubb, H .R. 1981. One Third of Our Time? New York: John Wiley and Sons, Inc.

Cordell, H. K. and English, D. B. K. 1984. Identification of Effective Supply Inventory Radii from Recreation Travel Distance Differences. Paper presented at the 1984 Southeastern Recreation Research Conference, Asheville, NC, February 16-17.

Cordell, B. M. and Cordell, H. K. 1984. A Conceptual Model of Social and Recreational Change. Paper presented at the National Leisure Research Symposium, Orlando, FL. October 21-23.

Cordell, H. K. and Hartmann, L. A. 1983. Assessing Outdoor Recreation in the United States. Trends 20(3): 37-46.

Glenn, N. D. 1977. "Cohort Analysis." Sage University Paper Series on Quantitative Applications in the Social Sciences, 07-005. Beverly Hills and London. Sage Publications.

Glenn, N. D. 1981. "The Utility and Logic of Cohort Analysis". Journal of Applied Behavioral Science. 17(2):247-257.

Mason, K.O., Mason, W.M., Winsborough, H.H., and Poole, W.K. 1973. "Some Methodological Issues in Cohort Analysis of Archival Data" American Sociological Review. 83:242-58.

Mueller, E. and Gurin, G. 1962. "Participation in Outdoor Recreation: Factors Affecting Demand Among American Adults". Government Printing Office, Washington, D.C.

Rentz, J.O., Reynolds, F.D., and Stout, R.G. 1983. "Analyzing Changing Consumption Patterns with Cohort Analysis." Journal of Marketing Research. 20(February 1983):12-20.

Riley, M. W. 1971. "Social Gerontology and the Age Stratification of Society". The Gerontologist. Spring, Part I, pp. 79-87.

Robinson, J. 1979. "The Nationwide Outdoor Recreation Survey: Some Results and Conclusions". The Third Nationwide Outdoor Recreation Plan, Appendix II, Survey Technical Report 4, pp. 1-121. U.S. Department of the Interior. Washington, D.C.

FIGURE 1 -- PERCENT OF RESPONDENTS PARTICIPATING IN CAMPING IN THE LAST 12 MONTHS, BY 10-YEAR COHORTS, FOR 3 NATIONAL RECREATION SURVEYS

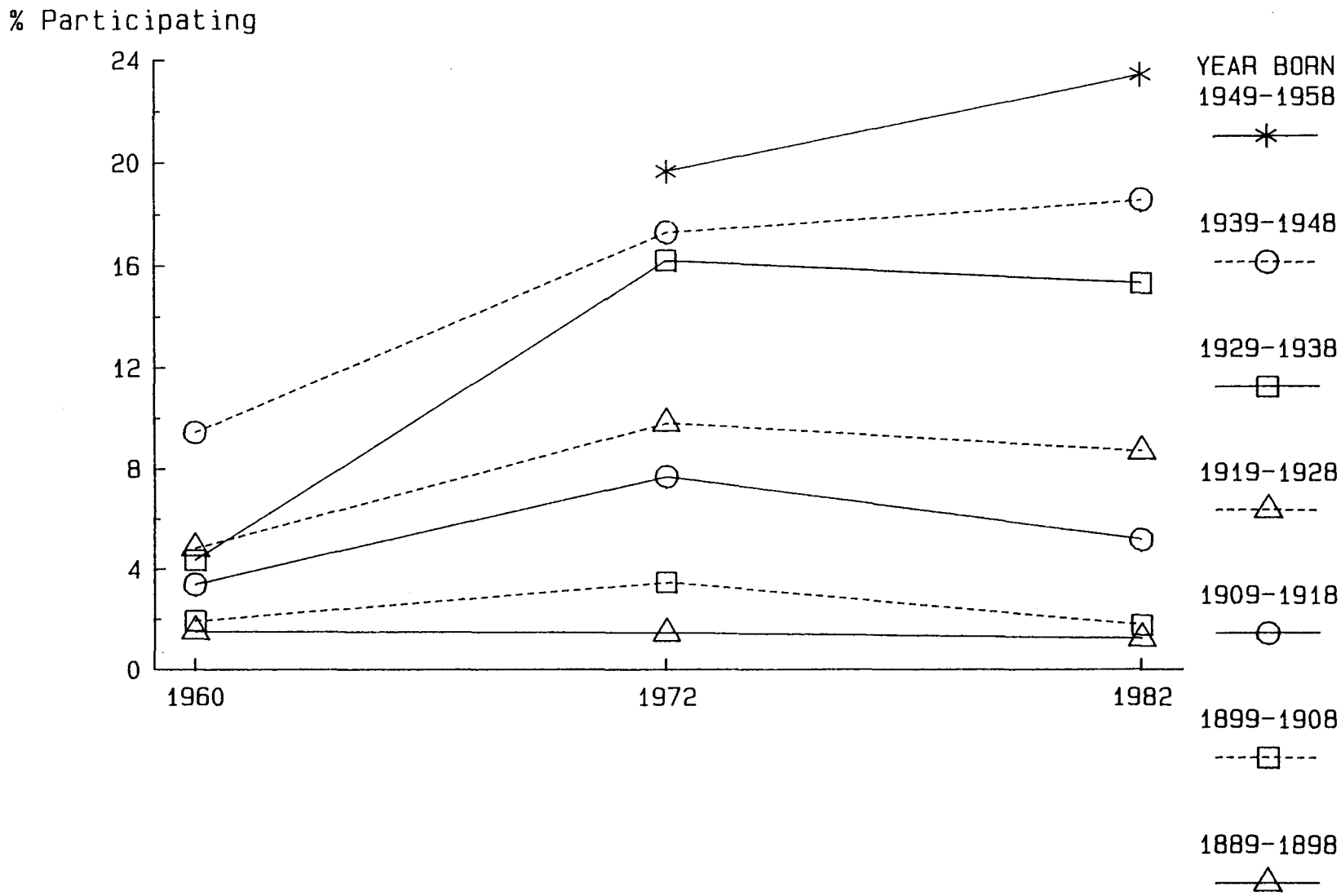

FIGURE 2 -- PERCENT OF RESPONDENTS PARTICIPATING IN FISHING IN THE LAST 12 MONTHS, BY 10-YEAR COHORTS, FOR 3 NATIONAL RECREATION SURVEYS

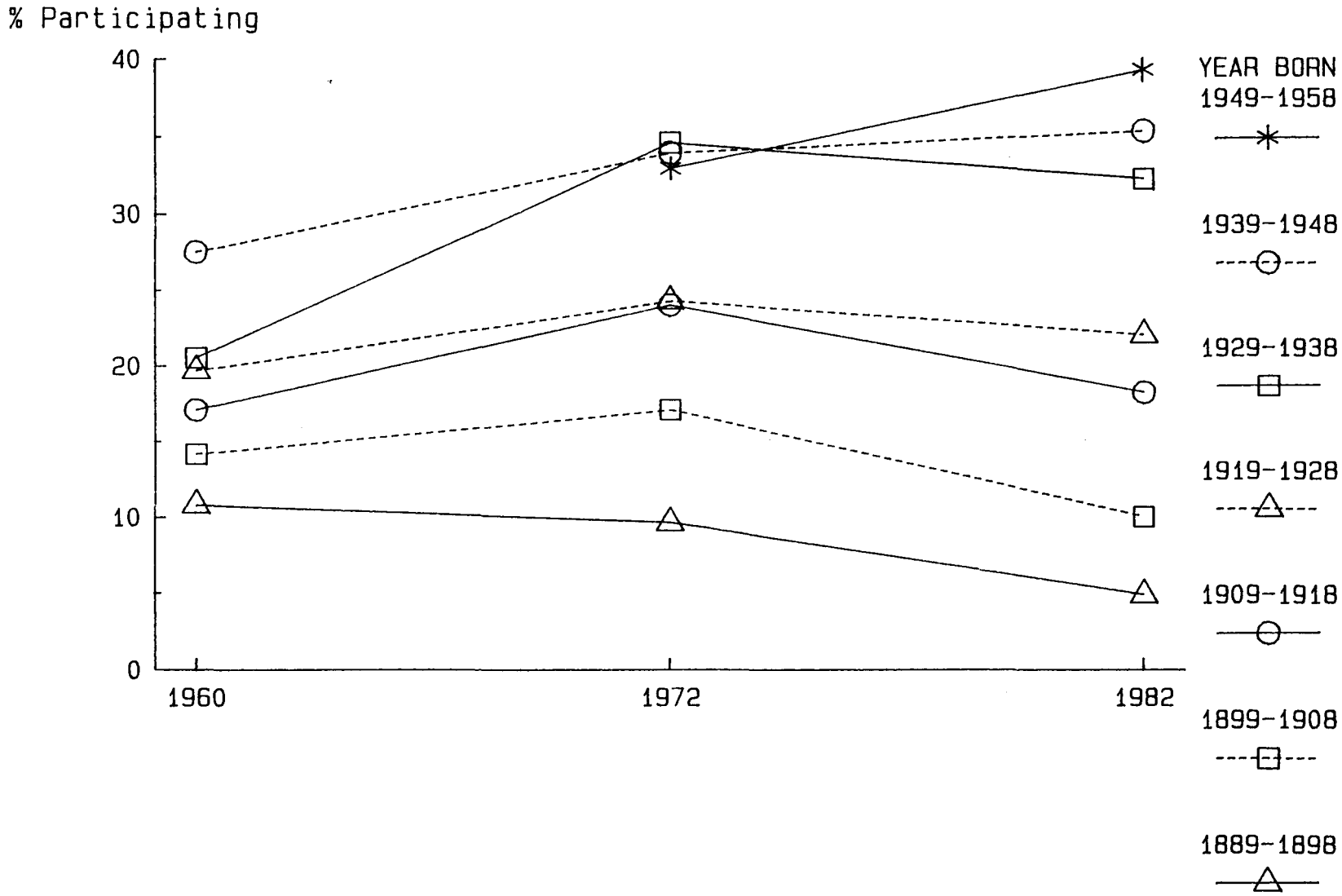

FIGURE 3 -- PERCENT OF RESPONDENTS PARTICIPATING IN HUNTING IN THE LAST 12 MONTHS, BY 10-YEAR COHORTS, FOR 3 NATIONAL RECREATION SURVEYS

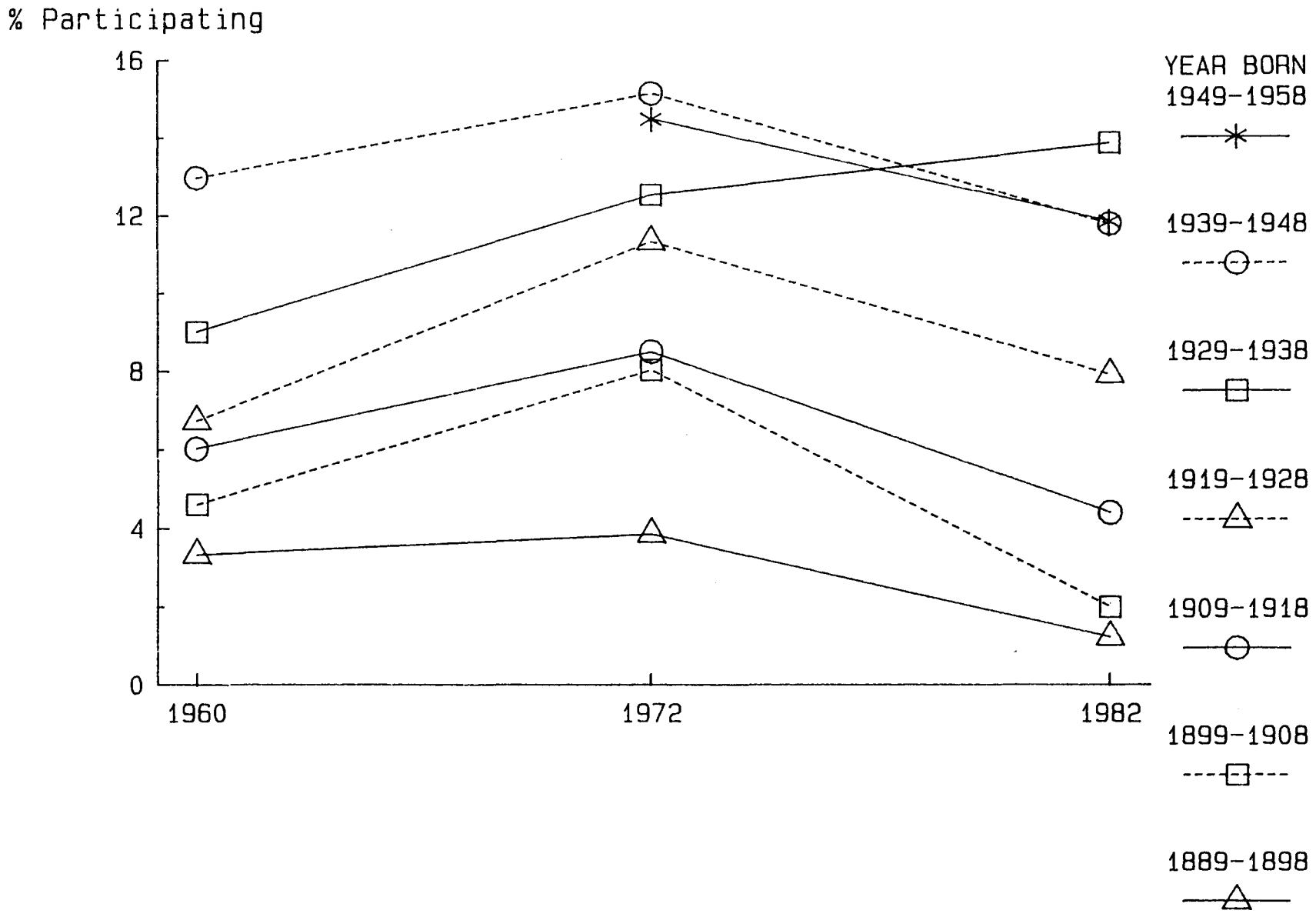

FIGURE 4 -- PERCENT OF RESPONDENTS PARTICIPATING IN HIKING IN THE LAST 12 MONTHS, BY 10-YEAR COHORTS, FOR 3 NATIONAL RECREATION SURVEYS

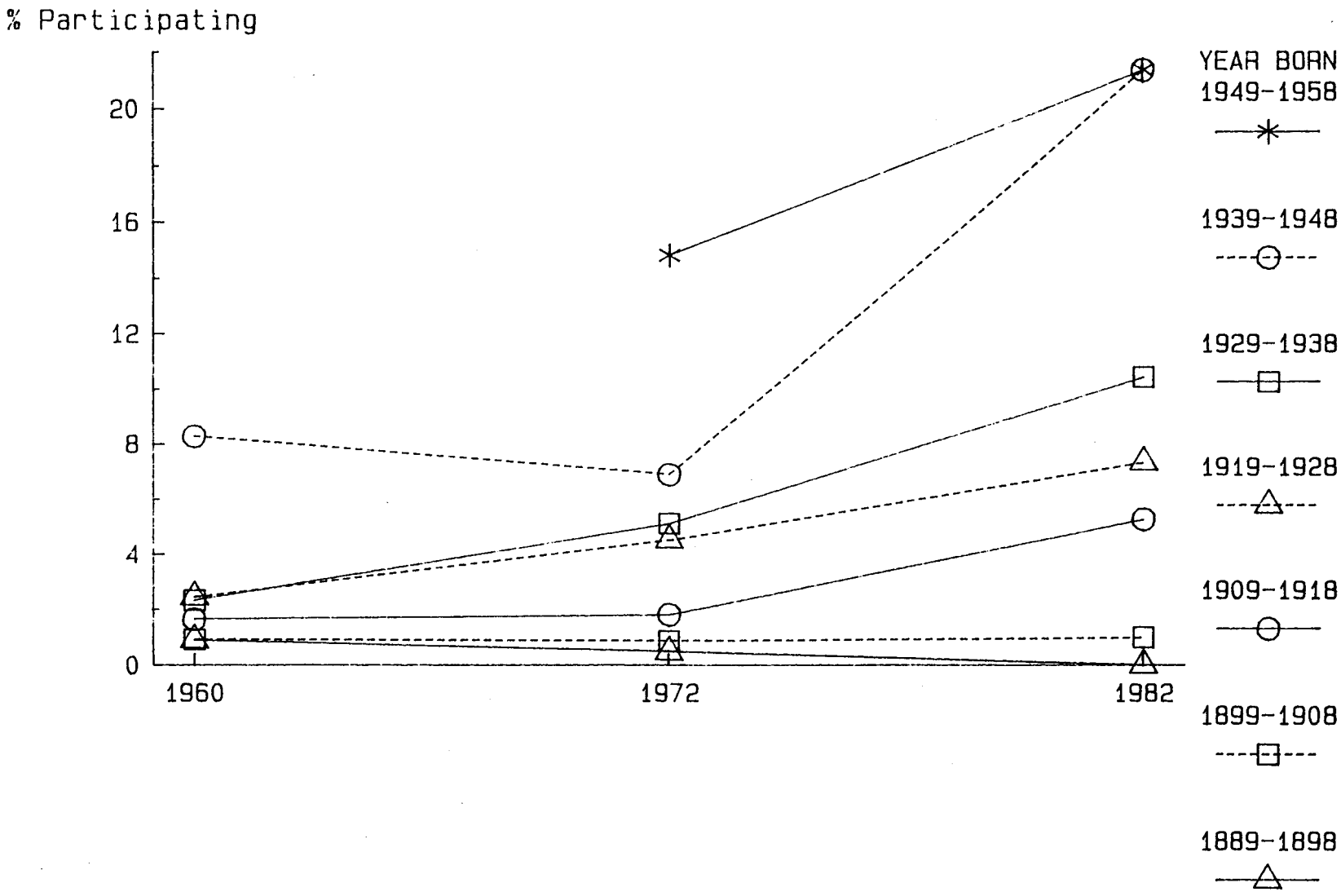

Table 1.--Percentage of respondents to 3 National Recreation Surveys participating in downhill skiing in the last 12 months by age group and year.

Age Group	Year		
	1960	1972	1982
12-21	1.23	8.74	11.86
22-31	0.76	5.30	10.75
32-41	0.47	4.02	7.90
42-51	0.21	3.00	4.21
52-61	0.20	0.62	1.10
62-71	0.0	0.0	0.70
72-81	0.0	0.0	0.0
82+	0.0	0.0	0.0

Table 2.--Percentage of respondents to 3 National Recreation Surveys participating in fishing in the last 12 months by age group and year.

Age Group	Year		
	1960	1972	1982
12-21	27.51	36.08	45.66
22-31	20.51	33.48	40.12
32-41	19.67	34.21	36.37
42-51	17.07	27.39	32.41
52-61	14.15	23.20	23.97
62-71	10.79	18.68	18.22
72-81	6.10	10.89	12.31
82+	2.14	3.77	5.97

Table 3.--Percentage of respondents to 3 National Recreation Surveys participating in camping in developed sites in the last 12 months by age group and year.

Age Group	Year		
	1960	1972	1982
12-21	9.43	20.60	23.59
22-31	4.34	17.70	23.59
32-41	4.82	17.91	19.66
42-51	3.38	9.94	16.69
52-61	1.94	7.80	9.50
62-71	1.53	4.67	5.56
72-81	0.43	2.33	2.59
82+	0.0	0.0	0.75

Table 4.--Percentage of respondents to 3 National Recreation Surveys participating in hiking and/or backpacking in the last 12 months by age group and year.

Age Group	Year		
	1960	1972	1982
12-21	8.27	15.23	22.62
22-31	2.33	9.02	20.49
32-41	2.45	5.03	21.78
42-51	1.65	4.50	13.94
52-61	0.92	1.64	7.16
62-71	0.91	1.56	5.98
72-81	0.0	0.39	1.51
82+	0.0	0.0	0.0

Table 5.--Percentage of respondents to 3 National Recreation Surveys participating in hunting in the last 12 months by age group and year.

Age Group	Year 1960	1972	1982
12-21	12.97	12.61	15.61
22-31	9.00	15.45	12.34
32-41	6.72	12.27	11.35
42-51	6.02	13.13	14.59
52-61	4.60	7.39	8.54
62-71	3.34	9.34	4.31
72-81	1.42	3.89	2.81
82+	0.71	1.89	2.24

Table 6.--Percentage of respondents to 3 National Recreation Surveys participating in downhill skiing in the last 12 months, by 10-year cohorts.

COHORT		Year 1960	1972	1982	1985
	Age	N/A	14-23	24-33	27-36
1	Percent participating	N/A	9.38	9.72	18.60
	Change from prior survey	N/A	--	+.34	+8.88
	Age	12-21	24-33	34-43	37-46
2	Percent participating	1.23	4.47	8.38	10.63
	Change from prior survey	--	+3.24	+3.91	+2.25
	Age	22-31	34-43	44-53	47-56
3	Percent participating	0.76	4.30	2.73	5.02
	Change from prior survey	--	+3.54	-1.57	+2.79
	Age	32-41	44-53	54-63	57-66
4	Percent participating	0.47	2.82	0.79	2.69
	Change from prior survey	--	+2.35	-2.03	+1.90
	Age	42-51	54-63	64-73	67-76
5	Percent participating	0.21	0.20	0.75	2.26
	Change from prior survey	--	-0.01	+0.55	+1.51
	Age	52-61	64-73	74-83	77-86
6	Percent participating	0.20	0.00	0.00	0.00
	Change from prior survey	--	-0.20	0.00	—
	Age	62-71	74-83	84+	
7	Percent participating	0.00	0.00	0.00	
	Change from prior survey	--	0.00	0.00	

Table 7.--Percentage of respondents to 3 National Recreation Surveys participating in fishing in the last 12 months, by 10-year cohorts.

COHORT		Year			
		1960	1972	1982	1985
	Age	N/A	14-23	24-33	27-36
1	Percent participating	N/A	32.96	39.29	55.23
	Change from prior survey	N/A	--	+6.33	+15.94
	Age	12-21	24-33	34-43	37-46
2	Percent participating	27.51	33.98	35.36	51.61
	Change from prior survey	--	+6.47	+1.38	+16.25
	Age	22-31	34-43	44-53	47-56
3	Percent participating	20.51	34.64	32.26	54.79
	Change from prior survey	--	+14.12	-2.37	+22.53
	Age	32.41	44-53	54-63	57-66
4	Percent participating	19.67	24.29	22.02	46.98
	Change from prior survey	--	+4.62	-2.27	+24.96
	Age	42-51	54-63	64-73	67-76
5	Percent participating	17.07	24.04	18.22	35.33
	Change from prior survey	--	+6.97	-5.82	+17.11
	Age	52-61	64-73	74-83	77-84
6	Percent participating	14.15	17.10	10.00	26.02
	Change from prior survey	--	+2.95	-7.10	+16.02
	Age	62-71	74-83	84+	
7	Percent participating	10.79	9.62	4.88	
	Change from prior survey	--	-1.17	-4.74	

Table 8.--Percentage of respondents to 3 National Recreation Surveys participating in developed camping in the last 12 months, by 10-year cohorts.

COHORT		Year			
		1960	1972	1982	1985
	Age	N/A	14-23	24-33	27-36
1	Percent participating	N/A	19.63	23.33	50.60
	Change from prior survey	N/A	--	+3.70	+27.27
	Age	12-21	24-33	34-43	37-46
2	Percent participating	9.43	17.29	18.48	47.92
	Change from prior survey	--	+7.86	+1.19	+29.44
	Age	22-31	34-43	44-53	47-56
3	Percent participating	4.34	16.19	15.25	35.13
	Change from prior survey	--	+11.85	-0.94	19.88
	Age	32-41	44-53	54-63	57-66
4	Percent participating	4.82	9.79	8.65	24.31
	Change from prior survey	--	+4.97	-1.14	+17.66
	Age	42-51	54-63	64-73	67-76
5	Percent participating	3.38	7.68	5.12	20.46
	Change from prior survey	--	+4.30	-2.56	+15.34
	Age	52-61	64-73	74-83	77-86
6	Percent participating	1.94	3.46	1.75	10.99
	Change from prior survey	--	+2.52	-1.71	9.24
	Age	62-71	74-83	84+	
7	Percent participating	1.53	1.44	1.22	
	Change from prior survey	--	-0.09	-0.22	

COHORT		Year 1960	1972	1982	1985
	Age	N/A	14-23	24-33	27-36
1	Percent participating	N/A	19.63	23.33	50.29
	Change from prior survey	N/A	--	+3.70	+26.44
	Age	12-21	24-33	34-43	37-46
2	Percent participating	9.43	17.29	18.48	45.79
	Change from prior survey	--	+7.86	+1.19	27.31
	Age	22-31	34-43	44-53	47-56
3	Percent participating	4.34	16.19	15.25	28.10
	Change from prior survey	--	+11.85	-0.94	12.85
	Age	32-41	44-53	54-63	57-66
4	Percent participating	4.82	9.79	8.65	31.60
	Change from prior survey	--	+4.97	-1.14	22.95
	Age	42-51	54-63	64-73	67-76
5	Percent participating	3.38	7.68	5.12	23.18
	Change from prior survey	--	+4.30	-2.56	18.06
	Age	52-61	64-73	74-83	77-86
6	Percent participating	1.94	3.46	1.75	13.28
	Change from prior survey	--	+2.52	-1.71	11.53
	Age	62-71	74-83	84+	
7	Percent participating	1.53	1.44	1.22	
	Change from prior survey	--	-0.09	-0.22	

Table 10.--Percentage of respondents to 3 National Recreation Surveys participating in hunting in the last 12 months, by 10-year cohorts.

COHORT		Year			
		1960	1972	1982	1985
	Age	N/A	14-23	24-33	
1	Percent participating	N/A	14.44	11.77	21.61
	Change from prior survey	N/A	--	-2.67	+10.84
	Age	12-21	24-33	34-43	
2	Percent participating	12.97	15.11	11.71	20.96
	Change from prior survey	--	+2.14	-3.40	+9.25
	Age	22-31	34-43	44-53	
3	Percent participating	9.00	12.50	13.80	21.14
	Change from prior survey	--	+3.50	+1.30	+7.34
	Age	32-41	44-53	54-63	
4	Percent participating	6.72	11.30	7.86	17.87
	Change from prior survey	--	+4.58	-3.11	+10.01
	Age	42-51	54-63	64-73	
5	Percent participating	6.02	8.48	4.37	10.40
	Change from prior survey	--	+2.46	-4.11	+6.03
	Age	52-61	64-73	74-83	
6	Percent participating	4.60	8.01	2.00	2.27
	Change from prior survey	--	+3.41	-6.01	+0.27
	Age	62-71	74-83	84+	
7	Percent participating	3.34	3.85	1.22	X
	Change from prior survey	--	+0.51	-2.63	