

Does Youth Rule? Trends in the Ages of American Women Tennis Players, 1960-1992

David W. Galenson
Department of Economics
University of Chicago

Introduction

There is a widespread belief that competitive women tennis players are typically younger today than in the past.¹ Peter Alfano, currently editor of *International Tennis*, explained in 1989 that there were three principal reasons for this. One was technological change since the mid-1970s in the construction of rackets: “young players are now able to compensate for a lack of size and strength with the power generated by these rackets.” A second was increasing opportunities for juniors to play competitive tennis, allowing players to “become match-tough and accustomed to pressure at an early age.” And a third was improved preparation: young players have “benefited from advances in training and conditioning practices.” As a result of these and other changes, Alfano concluded, “the primary age of a tennis pro is being lowered.”²

Similar observations have been offered by several of today’s top women players. When an interviewer recently asked her, “Why are there more 15-year-olds surfacing now compared to when you started playing professionally?” Martina Navratilova replied: “There’s much better coaching, better equipment. Times have changed. For the better? I don’t know. Players are better at an earlier age, but then they quit earlier as well.” In discussing the consequences of this pattern, Navratilova mentioned the cases of Tracy Austin and Andrea Jaeger, both of whom had been ranked among the world’s top three players by the age of 17, but both of whom were forced to retire in 1983, at the ages of 20 and 18, respectively, as a result of tennis-related injuries. Navratilova predicted that such cases would become more common in the future: “We’ll see these hot flashes in the pan and then they’ll just disappear.”³ Monica Seles recently compared women’s tennis to another

1. I am grateful to Stanley Engerman and John Letts for comments on an earlier draft of this paper. Dennis Ralston and Harold Zimman gave valuable advice on sources of evidence. Steven Hescovici, Thomas Walker, and Bruce Weinberg performed excellent research assistance.

2. Peter Alfano, “The Oversized Generation: Big Rackets Help Youth Rule in Tennis,” *International Herald Tribune*, June 27, 1989, 15.

3. David Higdon, “Martina,” *Tennis* (March 1992): 20.

sport dominated by young athletes: "I think what's happening in tennis is what's happening in gymnastics. The players are getting younger and younger." She referred to the recent succession of young women champions, including Tracy Austin, Steffi Graf, Seles herself, Jennifer Capriati, and Anke Huber, and noted: "Each younger one is doing better and better. I don't know what age it will end."⁴

The innovations cited by Alfano and others may have resulted in changes in playing techniques and training methods that have lowered the optimum age of women tennis players. Yet beyond the dramatic examples of a handful of champions whose careers are familiar even to casual sports fans, little is known of the experience of the great majority of competitive players. Do women tennis players mature earlier today than they did 10, 20, or 30 years ago? Do they typically reach their competitive peak sooner, and retire earlier? This paper will use quantitative evidence on the careers of a sizeable group of players to provide systematic answers to these questions.

The Data

No available data source contains information about the careers of all world-class women tennis players over an extended period of time. Lacking such a source, this study is based on a data set constructed to cover a substantial subset of world-class players over the past three decades. Specifically, this study attempted to obtain the ages of all women who were nationally ranked by the United States Tennis Association during the years 1960-1992.⁵ The published women's rankings do not include information on the ages of those ranked. The ages of the great majority of the women were obtained through searches of the USTA's published national rankings for girls aged 18 and under, 16 and under, and 14 and under, which do include birthdates for all ranked. Some nationally ranked women could not be found in junior rankings from earlier years; ages for some of these were obtained from other published sources, from the records of USTA sectional associations, or from interviews with players.⁶

The number of women ranked is determined annually by the USTA ranking committee and has increased substantially during the period considered here. From an annual average of 28 women in the 1960s, the number more than doubled to an average of 58 during the '70s, and increased further to 69 in the '80s, before falling to an average of 47 during 1990-92. A total of 341 different women were nationally ranked during 1960-92. The data set

4. Eliot Berry, *Tough Draw* (New York: Henry Holt, 1992), 227-228.

5. These rankings appear in the *USTA Tennis Yearbook*, published annually throughout the period studied here by H. O. Zimman, Inc., Lynn, Mass.

6. The published sources examined were World Championship Tennis, *International Who's Who in Tennis* (Dallas, 1983), and Women's Tennis Association, *Official 1993 Kraft Tour Media Guide* (St. Petersburg, Fla., 1993). I thank the following officers of USTA sectional associations for providing birthdates of their members: Wendell Coleman, Mid-Atlantic TA; John Callen, Southern TA; Stephanie Reiss, Eastern TA; Ken McAllister, Texas TA; and Patti Roy, New England TA. I am also grateful to those players who provided their birthdates to me in telephone conversations.

used in this study includes birthdates for 324 of these, or 95 percent of the total. Those with missing birthdates tended to be less successful players, as none of the 17 was ranked in more than three years, and only four ever held numerical rankings in the top 40.

Competitive tennis is an international industry, and it is unfortunate that this study is restricted to American citizens and residents. Yet the United States is by far the single most important source of world-class tennis players. In 1992, for example, 25 of the top 100 women in the year-end international singles rankings were American, while no other country accounted for as many as half that number.⁷ In the same year, more than one fifth of the women who played singles at Wimbledon were American, as were more than one quarter of those who played at the U.S. Open.⁸

Trends in the Ages of Tennis Players

Table 1 presents the mean ages of all women nationally ranked in each year during 1960-92; these are graphed in Figure 1.⁹ This series clearly indicates that there has been an increase in the average age of women players over time. The mean age of all the women was under 19 in 1960 and was below 20 in four years during the 1960s. The mean was below 21 in 11 of 14 years prior to 1974; in contrast, the mean fell below 22 in only one of 17 years beginning in 1977. And the mean reached 23 in 1987, and has been at or above that level in three of the past six years. The five-year averages also given in Table 1 show an increase from just under 20 during the early '60s to nearly 21 in the late '60s and early '70s, to 22 in the late '70s and early '80s, and to 23 in the late '80s and early '90s.

Thus over time there has been an increase in the mean age of all nationally ranked players, with no sign of decline in recent years; indeed the mean age for 1992, of 23.3, was above those for all of the previous 32 years. It is possible, however, that the changes described by the observers quoted earlier did not affect all players, but rather applied to only the top players. Table 2 considers this possibility, presenting the annual mean ages of the top 10 and top 20 players nationally; these are graphed in Figure 2.

Both series in Table 2 show an increase from the 1960s to the mid-'70s. Unlike the series for all players, however, both the top 10 and the top 20 show a substantial decline in mean age during the late '70s and early '80s; from a peak of 25 in 1977, for example, the mean for the top 20 fell below 21 in 1983, while the mean age of the top 10 fell from 24 in 1975 to less than 20 in 1981. Both series then rose during the late '80s, and remained at high levels during the early '90s. Thus, for example, in 1992 the mean age of the top 10 was over 25, the highest level of the period examined and almost certainly the highest in the history of American tennis. And the five-year

7. WTA, *1993 Media Guide*, 320.

8. *Tennis Week*, Vol. 20, No. 2 (July 1, 1993): 15; 1993 *USTA Tennis Yearbook*, 433-34.

9. All ages were calculated as of July 1 of the ranking year.

averages of Table 2 also show that by the end of the period the mean ages of both the top 10 and top 20 were as high as they had ever been previously.

During the period of rising overall mean ages in the '70s the mean ages of the top 10 and 20 were consistently greater than those of all ranked players. During the early '80s, however, this relation was reversed, as the means of both the top 10 and 20 fell below those of all players. In recent years, the mean ages of the top players have generally been similar to those of the others.

There are several interesting features of these series. The increase in average ages during the 1970s was almost certainly a result of the arrival of professional tennis for women. Prior to 1970, women's tennis was an amateur sport; not only did players not win money, but they were not allowed to earn money for endorsements or any other activities related to tennis. The first professional women's tournament was held in 1970, and the total prize money available for women grew rapidly during the '70s and '80s: from a total of \$250,000 in 1971, prize money on the women's tour increased to \$7.2 million in 1980, and \$23 million in 1990.¹⁰ During the initial phase of the professional era Billie Jean King, who first organized the women's pro tour, noted that "more women are making tennis their lifelong careers."¹¹ The moderate amounts of prize money available in the early years meant that the economic incentives for prolonged competition were initially concentrated among the best players, and the mean ages of the top players rose more rapidly during the early '70s than did those of lower ranked players. As total prize money on the women's tour continued to increase, however, the economic incentives became more widespread and the mean age of all ranked players also rose.

But ages did not simply continue to rise throughout the remainder of the period analyzed. Although the mean age of all players was not greatly affected, the average ages of the better players declined sharply during the late '70s and early '80s. This decline may have been a consequence of the new popularity of tennis during the 1970s. Tennis enjoyed an extraordinary increase in public interest during the early '70s: it has been estimated that the number of Americans who played tennis annually rose from 10 million in

10. WTA, *1993 Media Guide*, 8, 377.

11. King quoted in Michael Mewshaw, *Ladies of the Court* (New York: Crown Publications, 1993), 51.

1970 to more than 30 million during 1974-78.¹² The attractiveness of competitive tennis to young girls at this time was also increased by the success of Chris Evert, who reached the semifinals of the U.S. Open in 1971 at the age of 16. The most talented of the children who began playing tennis during the early and mid-'70s began to enter adult women's competition in their teen ages during the late '70s and early '80s and the larger numbers of players in this cohort meant that there would be more of these talented players than in earlier times. This early entry into adult competition of the most promising players could account for the drop in the mean ages of the top players, while the average age of all competitive players changed much less.¹³

The increase in the mean ages of the top players during the past 10 years may in turn have been a result of a subsequent decline in the popularity of tennis during the 1980s. The tennis boom of the '70s gave way to a bust, as the estimated number of Americans who played tennis fell to 13 million in 1985.¹⁴ The smaller numbers of children attracted to the sport during the

12. *Tennis Week*, Vol. 19, No. 15 (March 25, 1993): 17; Vol. 19, No. 17 (April 22, 1993): 38.

The progress of the tennis boom can be seen in the changing numbers of players ranked by the USTA over time. The following table shows the annual mean numbers of women ranked nationally since 1960, in both adult and junior age categories:

Dates	Women	18s	16s	14s	12s
1960-64	20	32	24	13	8
1965-69	21	38	33	28	25
1970-74	32	55	68	46	36
1975-79	65	97	90	85	69
1980-84	75	136	128	128	121
1985-85	64	162	150	154	134
1990-92	47	153	133	138	—

In the early years of the boom, the greatest increase in the number of ranked players was at younger ages; the biggest proportional increases in the late '60s appear in 12s and 14s, and the greatest increases in the early '70s are in 14s and 16s. Large increases then also appear for 18s and women in the late '70s, followed by generally lower rates of increase in the '80s. The number of adult women ranked has actually fallen since the early '80s.

This evidence thus suggests that the tennis boom of the '70s produced a larger supply of competitive tennis players than had been typical in earlier years.

13. This argument concerning the effects of the tennis boom has two premises: 1) that the larger number of women in a birth cohort who play tennis, the larger the number of exceptionally talented players that cohort will produce, and 2) that in any birth cohort, only the most talented players will tend to enter adult competition at very young ages. Lack of time-series evidence on the total numbers of women who play tennis makes it difficult to test the first premise. (Indirect evidence of the unusually large numbers of women who began playing during the tennis boom is provided by the sharp increase in the numbers of women ranked nationally during the late '70s and early '80s; see fn. 12.) The logic of the second premise is that, in general, the only players who will enter adult competition at very young ages will be those who can compete successfully. Entering adult competition as a teenager has generally tended to mean foregoing college, and often high school, and most players will do this only if they expect immediate success in competition. A variety of evidence supports this premise. Thus, for example, six women have held the top ranking in the United States since 1960. One of these—Martina Navratilova—was a foreign national and not eligible for a U.S. ranking until the age of 22. The other five were first nationally ranked as adults at a mean age of 15.4 years, considerably below the mean ages at first ranking shown in Table 3 for all women ever ranked in the top 20.

14. *Tennis Week*, Vol. 19, No. 17 (April 22, 1993): 38.

1980s may account for a reduction in the rate of entry of excellent young players into women's tennis in recent years, and the consequent increasing mean age of the best American players.

The mean ages examined here clearly indicate that competitive American women players in general are typically older today than during the amateur era, and that today's players are also older on average than they were a decade ago. And Table 2 demonstrates that these statements apply even more strongly to the best players. Yet these aggregate data do not reveal some interesting facts about players' careers. At what age do women typically enter adult competition? When do women reach their peak in competitive tennis, and how long do they remain there? And when do women typically retire from world-class competition? The next section of this paper will use the USTA rankings to provide evidence that bears on these questions.

The Careers of Women Tennis Players

Table 3 presents evidence on the mean ages at which a number of events in players' careers occurred, over the course of the period studied here.¹⁵ All of these series are calculated only for successful players—defined here as all those ever ranked in the top 20. The first series shows that there has been little change over time in the mean age at which successful players first become nationally ranked: this mean was between 17 and 18 in four of six periods, and ranged only from a minimum of 17.1 to a maximum of 19.1.

There was somewhat more variation in the mean age at which women reached their personal best ranking. This mean rose by more than three years during the 1970s then fell by more than two during the early '80s. These two changes may reflect two effects discussed earlier, with the prolonged careers of many top players produced by the advent of prize money delaying the rise of younger players during the '70s, and the arrival of the greater number of very talented players in the tennis boom cohort resulting in earlier peak ages in the early '80s. The mean age at which women last achieved their best ranking closely mirrors the mean age at which they first achieved that rank, as the two series are always less than one year apart. Together the two series clearly imply that throughout the period analyzed, successful women players were typically at their competitive peak between the ages of 19 and 23.

The greatest changes over time in the timing of any of these career events appear in the mean age at retirement. From mean ages under 24 during the 1960s, this age rose to 27 during the late '70s and early '80s, and remained over 25 in the late '80s. The delayed retirement age resulted in substantially longer competitive careers, as the mean number of years in which successful players had been ranked at the time they retired rose from

15. All entries in Table 3 are period measures, i.e. each is based on evidence on the relevant event from the careers of all sample members for whom that event occurred within the years indicated. It might be noted that the data set used to produce this table includes evidence on the entire careers of women ranked by the USTA from 1960 on. Thus many women ranked during the 1960s had previously been ranked during the '50s, and those earlier ranking were taken into account in constructing the series of Table 3.

less than six years during the '60s and early '70s to nearly nine during the late '70s and '80s. Thus successful players who retired during the late '70s and '80s had been ranked on average twice as long as their predecessors who left competitive tennis in the early '60s. This increase is almost certainly the result of the professionalization of women's tennis, as the possibility of earning a living playing tennis has induced more women to compete considerably longer during the past 20 years.

The evidence of Table 3 offers no support for the claim that recent years have seen women tennis players mature earlier, or reach their competitive peak earlier, than in the past. Thus the mean age of successful players at the time they were first ranked was no different during the 1980s than during the late '60s and early '70s. Similarly, the mean age at which successful players first reached their peak ranking, or at which they last held that ranking, has changed little over the course of the past three decades, and was no lower during the '80s than at many times in the '60s and '70s. And what is certainly most notable about the evidence of Table 3 is that successful women players typically remained active in competition for substantially longer periods during the 15 years after 1975 than during the 15 years before that date.

The Young and the Old

The two preceding sections have clearly demonstrated that American women tennis players have not typically become younger in recent years. Yet in both sections the analysis has been based on averages. The possibility might remain that although the average age of women players has not declined over time, there have been increasing numbers of very young players, but that their presence is masked in averages by the presence of more old players: thus perhaps the central tendency of the age distribution has not declined, but only because there are not only more players in the distribution's left tail, but also in its right tail.

Table 4 considers this possibility, and rejects it. The number of teenagers in the top 20, as great as 14 in 1960, and 10 or more in six years during the '60s, has never been above eight since 1970, and has not been above six in any year since 1984. In 1993, there were only three teen-agers in the top 20; the number had only been lower twice since 1960. Nor have recent years been notable for the number of very young players. In 1960, 10 of the top 20 were below the age of 18, and there were six or more players under 18 in the top 20 three more times during the '60s. In contrast, there have never been more than five players under 18 in the top 20 in any year since 1970, and there have not been as many as four in any of the last four years.

Table 4 also shows that top 20 players over 30, a rarity during the amateur era, have become more common in the era of Open tennis. Players over 30 appeared in the top 20 in only three years during the '60s but there has been at least one woman over 30 in the top 20 in all but two years since 1973, and there have been two or more in 11 of the last 20 years. And while

only two different women achieved top 20 rankings past the age of 30 during the '60s, there were six in the '70s, six in the '80s, and there have already been five in the first three years of the '90s. There are also likely to be considerably more in the remaining years of this decade, for five women ranked in the top 20 in 1992 were 28 or 29.

Conclusion

In 1989, Peter Alfano contended that whereas in the past “most [tennis] players could not expect to win a major tournament until they were at least old enough to vote . . . That has changed dramatically during the 1980s.” In Alfano’s view, new racket designs, more opportunities for children to play, and better training techniques had caused players both to mature and to peak earlier in the past: “Tennis now has almost as many teen-age idols as the rock music world. The sport has spawned a never-ending succession of prodigies.” Supposedly, the impact of the changes was even greater for women’s tennis than for men’s: “teen-agers don’t fare as well among the men because they tend to mature physically at a later age than women.” Furthermore, not only did Alfano argue that “the primary age of a tennis pro is being lowered,” but he concluded “that trend . . . will probably continue.”¹⁶

This study of the careers of competitive American women players during the past three decades has provided little support for Alfano’s analysis, and even less for his prediction. Although the early 1980s did see a decline in the mean age of the best American women, by the time Alfano wrote mean ages were generally high: for example, in 1989 the top five American women had an average age of 26.8 years, the highest level of any of the 33 years covered by this study. Nor have women’s mean ages generally declined in the time since Alfano’s prediction: indeed, the mean age of all nationally ranked American women in 1992 was higher than in any other year during 1960-92, and probably the highest in the history of American tennis.

The belief of Alfano and others that the timing of women tennis players’ careers has changed is a generalization drawn from the experience of a small number of recent stars. These include Tracy Austin, who was first ranked in the world’s top 10 in 1978 at 16, Andrea Jaeger, who was ranked in the top 10 in 1980 at 15, Steffi Graf, ranked in the top 10 in 1985 at 16. Gabriela Sabatini, ranked in the top 10 in 1986 at 16, Monica Seles, ranked in the top 10 in 1989 at 16, and Jennifer Capriati, who entered the top 10 in 1990 at 14. Yet the evidence of this paper indicates that generalization from their experience to the careers of all women players is not appropriate: although the very youngest women players in recent years have been younger than in the past, the ages at which women players typically enter and leave adult competition have not declined over time.

16. Alfano, “The Oversized Generation,” 15.

As has been the case for men's tennis, the most important long-run demographic change in women's tennis during recent decades has been an increase in the mean ages of competitive players, with lengthening careers that have clearly been produced by the prize money of Open tennis.¹⁷ Occasional players of exceptional ability at extremely young ages have long been a striking feature of women's tennis, but at least insofar as American players are concerned, Peter Alfano's 1989 declaration that "Youth Rule in Tennis" appears greatly exaggerated.

17. For evidence on men, see David W. Galenson, "The Impact of Economic and Technological Change on the Careers of American Men Tennis Players, 1960-1991," *Journal of Sport History*, 20:2 (1993): 127-150.

Table 1: Mean Ages of All Nationally Ranked Women, 1960-1992

Year	Mean age (yrs.)	N	Year	Mean Age (yrs.)	N
1960	18.36	28	1981	22.40	75
1961	19.15	27	1982	22.07	72
1962	19.78	23	1983	21.90	72
1963	21.44	25	1984	22.00	76
1964	21.13	24	1985	22.23	70
1965	22.13	30	1986	22.94	68
1966	20.80	30	1987	23.21	63
1967	19.88	32	1988	22.67	63
1968	20.68	31	1989	22.90	50
1969	20.56	25	1990	23.00	49
1970	19.97	36	1991	22.90	40
1971	20.62	37	1992	23.31	52
1972	20.65	49	Five-Year Averages		
1973	20.61	46			
1974	21.24	51	1960-64	19.9	127
1975	21.49	63	1965-69	20.8*	148
1976	21.88	60	1970-74	20.7	219
1977	22.14	79	1975-79	22.0*	347
1978	22.23	77	1980-84	22.2	370
1979	22.21	68	1985-89	22.8	314
1980	22.80	75	1990-92	23.1	141

Note: Means include all women numerically ranked and all those in Category A. Women listed in Insufficient Data are excluded. For five-year averages an asterisk indicates that the mean is significantly different from that for the preceding period at the .10 level.

Table 2: Mean Ages of Top 10 and Top 20 Women, 1960-1992

Year	Top 10	Top 20	Year	Top 10	Top 20
1960	18.5	19.0	1981	19.6	21.2
1961	19.5	19.7	1982	22.0	21.8
1962	19.8	20.1	1983	20.6	20.7
1963	20.7	20.6	1984	21.8	21.7
1964	19.9	21.2	1985	22.7	21.7
1965	20.7	21.4	1986	23.2	22.3
1966	21.1	19.8	1987	24.0	23.3
1967	20.3	19.7	1988	23.7	22.6
1968	20.0	19.8	1989	24.2	23.5
1969	20.2	20.8	1990	22.3	23.8
1970	22.0	20.5	1991	23.4	23.1
1971	22.5	22.2	1992	25.1	23.5
1972	23.0	21.4	Five-Year Averages		
1973	23.8	22.3			
1974	23.3	22.4	1960-64	19.7	20.1
1975	24.0	22.8	1965-69	20.5	20.3
1976	23.0	23.1	1970-74	22.9*	21.7*
1977	23.6	25.0	1975-79	23.1	23.4*
1978	21.9	22.5	1980-84	21.0*	21.5*
1979	22.9	23.7	1985-89	23.6*	22.6*
1980	21.2	22.2	1990-92	23.6	23.4

Note: For five-year averages, an asterisk indicates the mean is significantly different from the entry for the preceding period at the .10 level.

Table 3: Timing of Career Events, for Women Ever Ranked in the Top 20, 1960-1989

Years	Age at first ranking		Age at first achieving best rank		Age at last achieving best rank		Age at last ranking		Years ranked at retirement	
	Mean years	N	Mean years	N	Mean years	N	Mean years	N	Mean years	N
1960-64	19.1	21	21.2	26	21.7	23	22.6	12	4.3	12
1965-69	17.3	23	20.0	24	20.6	25	23.7	20	5.5	20
1970-74	17.2	22	19.1	14	19.9	13	24.1	15	5.8	15
1975-79	18.5	25	22.3*	26	22.7*	26	26.9*	17	8.7*	17
1980-84	17.3	24	20.2*	22	20.7	22	27.1	27	8.6	27
1985-89	17.1	16	21.4	23	22.0	24	25.6	22	8.9	22

*Significantly different from mean for preceding period at .10 level.

Table 4: Number of Young and Old Players in Top 20, 1960-1992

Year	Number under 18	Number under 20	Number 30 and over
1960	10	14	0
1961	6	12	1
1962	3	12	0
1963	3	7	0
1964	4	6	1
1965	2	8	1
1966	7	12	0
1967	6	11	0
1968	4	10	0
1969	2	9	0
1970	3	8	0
1971	2	3	0
1972	3	8	0
1973	4	7	2
1974	3	6	2
1975	1	6	1
1976	0	2	1
1977	1	2	3
1978	5	8	2
1979	3	7	4
1980	4	7	2
1981	3	8	0
1982	2	8	1
1983	4	8	0
1984	3	6	1
1985	2	6	1
1986	3	6	1
1987	3	3	2
1988	4	6	2
1989	3	6	3
1990	2	6	4
1991	2	5	2
1992	2	3	1

Figure 1: Mean Age of All Nationally Ranked Women, 1960-1992

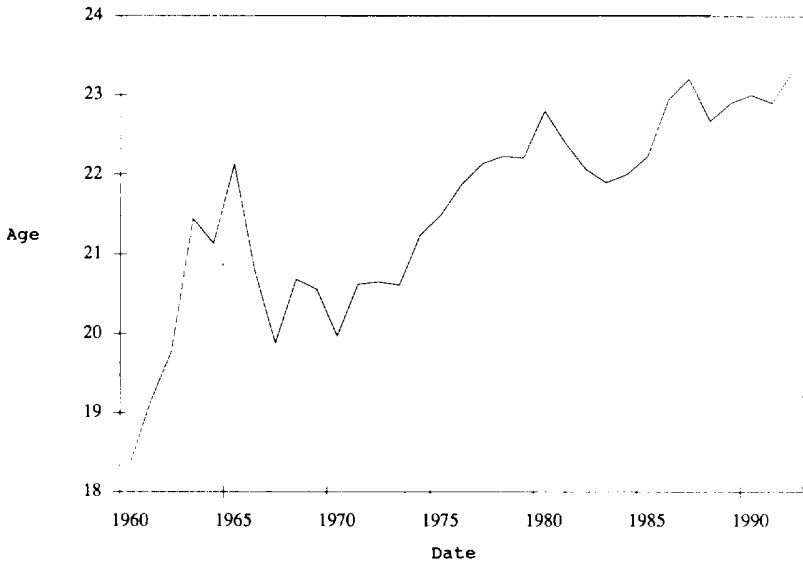


Figure 2: Mean Ages of Top 10 and Top 20 Women, 1960-1992

